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SOUTHERN APPALACHIAN COAL REGION

DRAFT ENVIRONMENTAL IMPACT STATEMENT II

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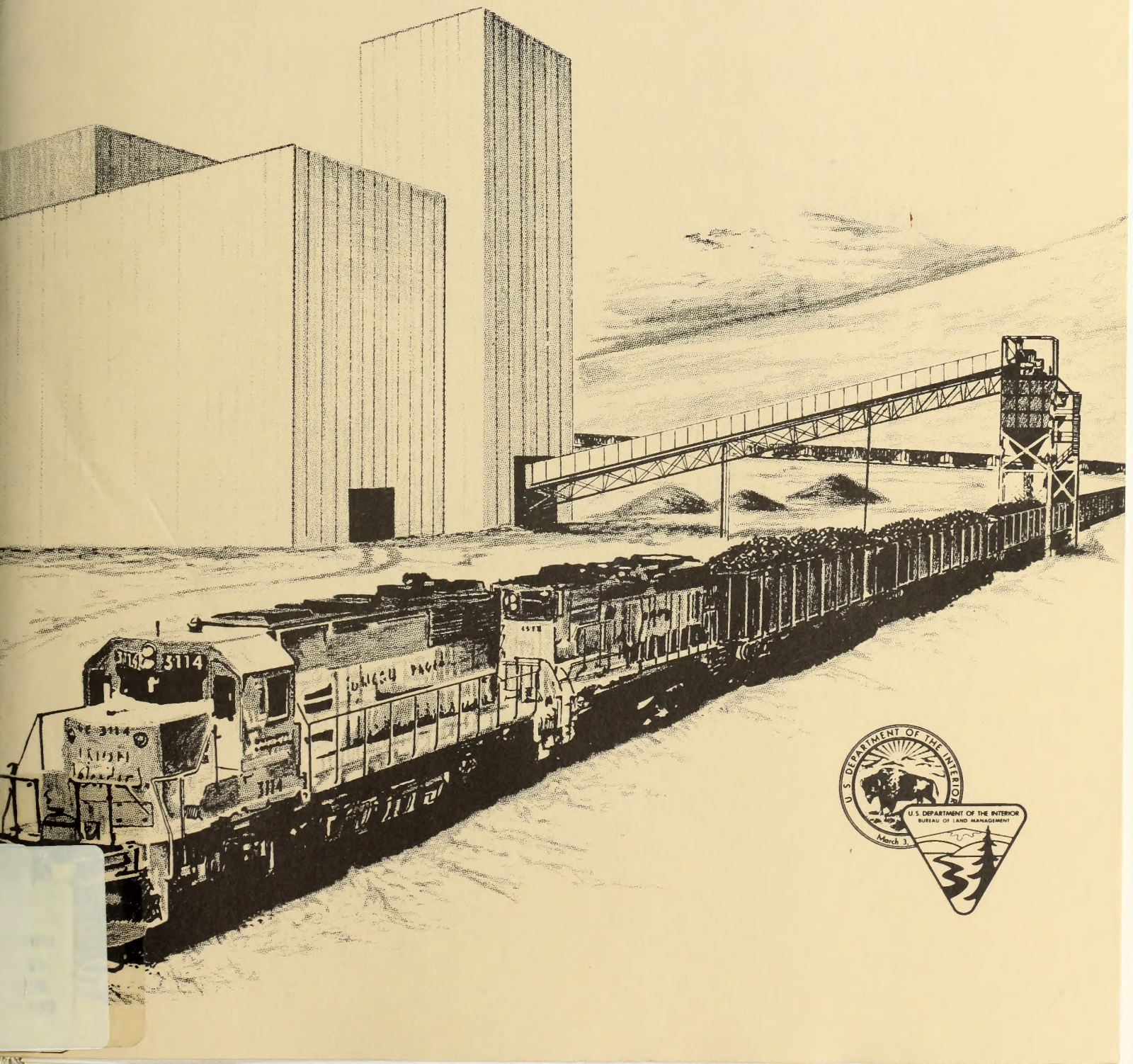

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United States Department of the Interior

BUREAU OF LAND MANAGEMENT

MAY 17 1983

Eastern States Office
350 South Pickett Street
Alexandria, Virginia 22304

NOTICE

Enclosed is the Southern Appalachian Regional coal Environmental Impact Statement II. Your review and comments regarding this Draft Environmental Impact Statement (DEIS) are invited. Comments on the DEIS may be submitted in writing or presented verbally at the public hearing. In order to be considered in the final EIS, all comments must be received by August 26, 1983. Comments should be addressed to:

Bureau of Land Management
Jackson Mall Office Center
300 Woodrow Wilson, Suite 3495
Jackson, MS 39213
(601) 960-4405; (FTS 490-4405)

A formal public hearing on this statement will be held August 31, 1983 from 9:00 - 11:00 a.m. at the Stagecoach Inn (Black Warrior Room), 4810 Boulevard East, Tuscaloosa, Alabama.

Written requests to testify should be submitted to the EIS Team Leader at the Jackson, MS address above prior to the close of business on August 24, 1983.

Both written comments received by August 26, 1983, and testimony presented at the public hearing will be fully considered and evaluated in the preparation of the Final Environmental Impact Statement (FEIS). Those comments that pertain to the adequacy of the impact assessment, or present new data, will be addressed in the FEIS.

The draft statement incorporates a number of other documents by referencing as provided for by Council of Environmental Quality regulations. Prominent among these are: Final EIS: Federal Coal Management Program (1979); North Central Alabama Land Use Analysis (1979) and update (1982); the Stovall-Files Environmental Assessment/Technical Examination (1979); and the Southern Appalachian Regional Coal EIS (1980). These documents, while not readily available for additional distribution, are available for public review at the BLM Eastern States Office and the BLM Jackson District Office.

Please retain your copy of the DEIS. Portions of this document will probably not be reprinted if changes in response to comments are minor.

L. Curtis Jones Jr.

Eastern States Director

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SOUTHERN APPALACHIAN REGIONAL COAL ENVIRONMENTAL IMPACT STATEMENT II

Prepared by:

DEPARTMENT OF THE INTERIOR

BUREAU OF LAND MANAGEMENT

Eastern States Office

Tuscaloosa Project Office

June 24, 1983

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SOUTHERN APPALACHIAN REGIONAL COAL
ENVIRONMENTAL IMPACT STATEMENT-II

Draft (X) Final ( )

The United States Department of the Interior, Bureau of Land Management

1. Type of Action: Administrative (X) Legislative ( )

2. Abstract: Under regulations of the Federal coal Management Program (43 CFR 3400), the Bureau of Land Management proposed to proceed with an active coal leasing program in North Central Alabama to help meet the nation's future energy needs. The environmental impacts of four leasing alterantives, including a No Action Alternative, are analyzed in this EIS. The preferred alterantive would offer for lease in mid-1984, 3 underground tracts and 12 surface-mineable tracts, which would result in an average annual production of approximately 8.47 million tons. If implemented, the preferred alternative would result in 5, 184 acres of surface disturbance by the year 1995. This acreage figure is quite small when compared with the no action (baseline) figure of 123,000 acres by same year.

3. Comments have been requested from the following:

See attached list.

4. For further information, contact:

Bureau of Land Management
Jackson Mall Office Center
300 Woodrow Wilson, Suite 3495
Jackson, MS 39213
(601) 960-4405
FTS 490-4405

Bureau of Land Management
Eastern States Office
350 South Pickett Street
Alexandria, VA 22304
(703) 235-3637
FTS 235-3637

5. Comments on the draft statement must be received no later than:

August 26, 1983

NOTE: The Minerals Management Service (MMS) was merged with the BLM on April 4, 1983. Accordingly, the Tuscaloosa Project Office will move to Jackson, Mississippi during the summer of 1983 and shall become a part of the Jackson District Office.

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The University of Alabama, Office of Archaeological Research

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Jasper
Northport
Oakman
Tuscaloosa

County Governments, Councils and Commissions:

Fayette
Jefferson
Tuscaloosa
Walker

Planning Agencies:

West Alabama Planning and Development Council
Birmingham Regional Planning Commission

OTHER ORGANIZATIONS AND INDIVIDUALS

Numerous other special interest groups, organizations, and individuals expressing interest in the proposed action have been sent copies of this statement and have been invited to comment.

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SUMMARY

The U.S. Department of the Interior proposes to continue an active coal leasing program in a 3-county (Fayette, Tuscaloosa, Walker) area of Alabama. This action is part of a nation-wide effort designed to help attain national energy goals. Four alternative courses of action, ranging from no new Federal leasing, to offering for lease 16 delineated tracts, are addressed in this document.

The chief environmental issue is the impact of coal mining on water quality and availability. Many other resource impacts are presented and analyzed here, but in nearly all cases, these are either insignificant, or are mitigated by existing regulations. Differences in impacts are mainly in degree, rather than in type.

Alternative Three, selected by the Regional Coal Team (RCT) as the preferred alternative, would offer for lease, in mid-1984, 3 underground tracts and 12 surface-minable tracts, provide for an average annual production of about 8.5 million tons during peak production years.

The last section presented in chapter 2--Alternatives Including the Proposed Action--includes a discussion of the lease by application scenario which will follow the second round of lease sales.

Six alternatives were discussed by the RCT; however, the decision was made to include only four in this document. One alternative would have included only the four underground tracts, but it was dropped because the RCT decided it would not be appropriate for the Alabama coal industry, which is dominated by surface mining companies. The decision factors are discussed in greater detail in the introduction to chapter 2.

The other alternative that was dropped would have added one underground tract to Alternative Two. It was dropped from discussion because the annual production, total in-place Federal coal resources, and recoverable Federal coal resources figures would each be within a few million tons of those for Alternative Four (leasing all tracts). Three characteristics of the additional underground tract also provide rationale for dropping this alternative from further consideration. They are: 1) the tract is considered essentially captive (i.e., only developable by one company) with development unfeasible in the near future; 2) the coal is of questionable quality; and 3) the scattered nature of Federal Mineral Ownership (FMO). The alternatives considered herein are:

1) Alternative One (no action)

This alternative would provide for no further competitive Federal coal leasing, other than the 15 tracts already under lease, resulting

from first round of lease sales or the lease by application process. Future leasing would only be in response to industry applications under the provisions of the Interior Department's coal management regulations. At present there are no anticipated lease applications and no projected by-pass of Federal coal resources. The comparative analysis of this alternative clearly shows that the expected impacts from projected private development are far greater in magnitude than any of the Federal leasing alternatives considered by themselves. Cumulative mined acreage projected in the 3-county area for 1995 is estimated at 123,000 acres. Of this total, the previously leased Federal tracts should account for approximately 1,000 acres mined.

2) Alternative Two (lease all high-ranked tracts)

This alternative would provide for the leasing of 3 underground tracts and 4 surface-minable tracts, yielding a projected average annual production (during peak years) of 6.9 million tons. The Federal in-place coal resources would total almost 180 million tons, with approximately 109 million tons of recoverable Federal coal resources. An estimated surface disturbance of 1,754 acres (742 acres over Federal minerals) would result from implementation of this alternative.

3) Alternative Three/Preferred Action (lease all surface tracts and all high-ranked underground tracts)

This alternative would provide for the leasing of 3 underground tracts and 12 surface-minable tracts, with a projected average annual production (during peak years) of 8.47 million tons. The Federal in-place coal resources would total over 184 million tons, with over 112 million tons of recoverable Federal coal resources. An estimated surface disturbance of 5,184 acres (2,052 over Federal minerals) would result from implementation of this alternative.

In March 1983, the RCT selected this as the preferred alternative. The higher number of surface tracts will appeal to the industry in the state; however, it also offers the 3 best underground tracts, should the market recover in 1984 or 1985 and make their development more economically feasible. Additionally, it provides two surface tracts as public body set-asides.

4) Alternative Four (lease all tracts)

This alternative would offer for lease the 4 underground tracts, plus all 12 of the surface-minable tracts, with a projected average annual production rate (during peak years) of over 10.5 million tons. Federal in-place coal resources would total over 211 million tons, with over 128 million tons of recoverable Federal coal resources. Implementation of this alternative would cause about 5,200 acres of surface disturbance (2,052 over Federal coal resources). This represents no increase in surface disturbance over Alternative Three.

An additional Federal action is discussed briefly in this EIS. This involves the lease-by-application activities that will take place at

industry discretion in the region after the completion of the second round of lease sales. Included in this action will be any delineated tracts that remain unsold after the second round of lease sales, as well as any Federal coal resources in the area that have development potential but were too scattered or small to allow for their delineation into mining units. Of the resources that fall into the latter category, there are approximately 6,000 acres that have some potential for future surface coal leasing.

About 48,000 acres which remain have uncertain or unknown potential for surface coal leasing. All of the approximately 54,000 acres have uncertain potential for undergound coal leasing. The uncertain potential of most of the remaining Federal coal resources places BLM into a reactive posture with regard to future leasing activities. The nature of the tracts does not dictate to their inclusion in the regional anaysis and sales program. Environmental impacts will be addressed on a case-by-case basis as applications are received.

HIGHLIGHTS

AIR QUALITY

No significant changes in the climate of the region are expected to result from any of the alternatives. Air pollution, as a result of fugitive dust from mining and indirect development, would be highly localized and would not significantly affect air quality, except in the immediate vicinity of the coal lease tracts. Population and transportation growth, which will accompany mining, will have a negligible effect on regional air quality. The impacts from Alternative Four, leasing of all the tracts, would add an insignificant amount of air pollution to the regional base.

GEOLOGY AND MINERAL RESOURCES

Large quantities of valuable minerals, which could be economically exploited, exist in the EIS region. Coal production generally would not interfere with extraction of other minerals and would not destroy valuable paleontological resources.

WATER RESOURCES

In the 3-county area, impacts resulting from Federal coal leasing will be small and localized because of the scattering of the relatively small tracts within a large area. The preferred alternative should not produce any significant water quality impacts on Lake Tuscaloosa. Impacts to major streams, if any, would be restricted to the point of

inflow. All impacts on surface water resources would be most significant under the no action alternative and, with Federal leasing, under Alternative Four.

Impacts to ground water resources will be restricted largely to the vicinity of mining operations. Impacts will be most significant under the preferred alternative, with an estimated 338 wells being prone to removal, increased mineralization, or water level declines. Concentrations of dissolved solids, sulfate, and other constituents in aquifers receiving recharge from mines, may exceed maximum advisable contaminant levels defined in National Secondary Drinking Water Regulations (U.S. Environmental Protection Agency, 1977).

VEGETATION

The favorable growing climate in the 3-county area, coupled with available reclamation technology, should allow quick revegetation of disturbed areas. After reclamation, most mined lands should exhibit equal or higher plant productivity than now exists. Most landowners probably will opt to have their land reclaimed to improved pasture or pine plantations which will lower the onsite plant species diversity. Based on the lack of demonstrated reclamation technology for reestablishing a similar riparian or bottomland forest vegetation condition, any surface mining through these vegetation types could result in their long-term and irreversible loss. With the exclusion of riparian and bottomland forest vegetation to serve as a stream buffer zone and as valuable wildlife habitat, other openings in the extensive mixed-pine forest resulting from surface mining would increase vegetation diversity and "edge," thereby benefiting many wildife species in the Alabama Subregion.

WILDLIFE

Surface mining and construction of surface facilities supporting underground mines will cause short-term detrimental impacts to all terrestrial species occurring onsite. Smaller, less mobile species will be eliminated, and more mobile species will be forced into adjacent habitats, possibly resulting in over-crowding. With proper reclamation, including the reestablishment of any affected riparian or bottomland forest habitat, there will be little or no irreversible effect on terrestrial wildlife populations.

Many aquatic species occurring in small intermittent streams near mines could suffer short-term impacts because of increased sedimentation and lowered water quality from mine drainage. With proper enforcement of Alabama's surface mining regulations, mining should not significantly affect most aquatic populations in the larger perennial streams. However, there is a potential for significant impact on the flattened musk turtle, which the FWS is studying for possible listing as a

Threatened Species under the Endangered Species Act. This species, which is known to occur in some streams, creeks, and reservoirs within the Fayette, Tuscaloosa, and Walker County lease areas is thoght to be very susceptible to stream siltation, much of which has resulted from previous surface mining activities. Implementation of the preferred alternative should have little or no effect on listed Threatened or Endangered species.

LAND USE

Lands within the 3-county area are generally steep-sided hills, narrow ridgetops, and narrow hollows, with nearly level bottoms. The predominant land use in the region is more than 80 percent mixed forest, with surface mining also an important land use. The Wolf Creek Wildlife Management Area is a free-use public hunting area, portions of which lie within three of the proposed tracts: Lockhart Hill, Revised Pendley, and Willis Chapel. Surface mining is expected to increase in importance even without Federal coal leasing. Federal coal leasing is expected to have a very minor impact on land use in the region. Suitable replacement lands for forest use are available throughout the region.

The areas of high Federal coal ownership do not have comprehensive locally imposed land use restrictions. However, land used for surface mining is regulated by state and Federal agencies.

All surface over Federal coal proposed for leasing is owned privately.

SOILS

Soils in the EIS area are generally shallow and poor. No significant impacts to agriculture or forestry would result from any of the Federal action alternatives. Some opportunities would exist, through proper mining and reclamation, to enhance postmining land use potential. Regulations enforced by the Office of Surface Mining (OSM) would assure satisfactory reestablishment of equivalent soil.

CULTURAL RESOURCES

Cultural properties are non-renewable resources. The physical destruction of any cultural data or artifacts could have a negative impact on efforts to reconstruct the prehistoric and historic culture history of the region.

There are few known cultural properties located on minable areas within the proposed lease tracts. The few that are recorded in the areas have low potential for eligibility to the National Register of Historic Places; however, official determinations of these properties have not yet been made.

Prior to mine plan approval, intensive field inventories (BLM Class III) are required by lease stipulations for all areas subject to ground disturbance, and which were not previously inventoried at such a level of intensity.

Data on locations of cultural properties, gathered through required inventories, will be beneficial in the long-term. Inventories should have positive effects by providing additional knowledge about the Fall Line Hills region concerning prehistoric site distribution, as well as knowledge of late-19th to mid-20th century American settlement patterns.

RECREATION

Recreational opportunities in the area of concentrated Federal minerals ownership are limited to casual use for hunting. Suitable alternate lands for this use are available throughout the region. Population increases attributable to leasing Federal coal are expected to be insignificant. Therefore, formal recreational developments will not be significantly affected.

VISUAL RESOURCES

There are no unique or outstanding visual resources in association with any of the proposed second-round lease tracts. Surface owners have the right to alter the appearance of their properties at their discretion. Therefore, Bureau of Land Management (BLM) has no direct visual resource management (VRM) responsibility within the 3-county area.

SOCIO ECONOMICS

Continuous moderate increases in area population are expected, with or without new Federal coal leasing. The increases will not signifcantly change the social structure of the area but they will impose a moderate financial burden on the communities, as a result of required improvements in community facilites and services. The actual growth related to Federal leasing will be minimal, with a 10 percent miner in-migration projected for underground tracts only. These in-migrants will be dispersed throughout the area so that the communities of Jasper, Northport, Tuscaloosa, and Birmingham will receive the majority of growth. These are the communities that can most readily absorb such growth.

The total mine-related income, as well as the projected socondary income, will inject a significant flow of money into the local economy. Local consumptive-base taxes, in conjunction with severance taxes and royalties, should inject sufficient public funds into the area to pay for the community facility and service improvements.

The attitude of area residents is pro-economic growth (in this case mining) with minimal environmental degradation (in this case achieved through mitigation and reclamation), especially in this particular period of recession where area unemployment rates are on the rise.

TRANSPORTATION

The 3-county area covered in this EIS has adequate transportation facilities capable of handling all of the needs generated by any of the alternatives. The road systems considered in the analysis should not undergo any major additional increases in congestion as a result of any of the listed alternatives.

There are sufficient rail and barge facilities in the EIS area and their capacities far exceed any potential increase in load caused by the Federal coal leasing program.

The transportation analysis was presented in a "worst case" manner. It should be understood that the presented examples are just some of the many possibilities that could occur, and in reality, different modes or combinations of modes may exist. In any case, the tri-county area should be able to handle the increased traffic associated with the proposed action in this EIS.

TABLE S-1
DELINEATED FEDERAL COAL TRACT SUMMARY SHEET

TRACT	COUNTY	MINE TYPE	ACREAGE TOTAL/FMO	SURFACE MINABLE ACREAGE TOTAL/FMO	IN-PLACE COAL RESOURCE (X 10^6) TOTAL/FMO	RECOVERABLE COAL RESOURCE (X 10^6) TOTAL/FMO	MINE LIFE	ANNUAL PRODUCTION	INDUSTRY INTEREST	ALTERNATIVE CONTAINING TRACT	COMMENT
Blue Creek	Tusc.	U	11,520/8080	N/A	132.6/99.6	79.6/59.8	40	2.2 million	No	2,3,4	Overlain by Spencer Hill & Jock Creek. Met. coal
Cripple Creek	Tusc.	U	14,880/5360	N/A	88.2/31.4	61.7/16.1	25	1.8 million	No	2,3,4	O/L by R. Wiley Sandtown Crabbe Rd. & Poplar Hollow. Met. coal
Sandtown	Fayette Tusc.	U	12,760/8160	N/A	72.9/46	48.5/30.6	35	1.4 million	No	2,3,4	Overlain by Poplar Hollow
(R) Wiley	Tusc.	U	13,520/3760	N/A	106.5/27.3	62.3/15.9	28	2.1 million	No	4	Overlain by Crabbe Road
(R)Bagwell Road	Tusc.	S	1,000/440	300/120	0.99/0.34	0.84/0.26	5	170,000	Yes	3,4	Public Body Set-Aside
(R) Boxes CR By-pass	Fayette	S	180/180	99/99	0.37/0.37	0.34/0.34	3	114,000	Yes	2,3,4	Tract contains no private coal. Bypass
(R) Crabbe Road	Tusc.	S	1520/680	312/150	0.95/0.43	0.81/0.36	4	200,000	Yes	3,4	Public Body Set-Aside
Jock Creek	Tusc.	S	1877/787	630/290	2.45/1.09	2.2/0.98	4.5	500,000	Yes	2,3,4	
Lockhart Hill	Walker	S	840/160	473/120	0.81/0.21	0.73/0.19	11	67,000	Yes	3,4	
Panther Branch	Tusc.	S	1239/384	765/250	4.73/1.09	4.25/0.98	9	500,000	Yes	2,3,4	
(R)Pendley	Fayette	S	640/640	110/110	0.31/0.31	0.28/0.28	2.5	110,000	Yes	3,4	Tract contains no private coal.
Pleasant Grove Ch.	Fayette	S	840/480	260/103	0.73/0.30	0.66/0.27	2	400,000	Yes	2,3,4	
Poplar Hollow	Tusc. Fayette	S	2640/720	765/240	3.07/1.09	2.62/0.93	11	250,000	Yes	3,4	
Spencer Hill	Tusc.	S	3120/1360	725/290	2.02/0.59	1.73/0.51	7	250,000	Yes	3,4	
Watermelon Road	Tusc.	S	1639/480	600/160	3.44/0.83	3.1/0.74	8	400,000	Yes	3,4	
Willis Chapel	Walker	S	75/50	75/50	0.16/0.11	0.14/0.09	1.5	110,000	Yes	3,4	

(R) Revised
O/L Overlain

Source: MMS/8LM Tract Summary Reports

CHAPTER 1

PURPOSE AND NEED FOR ACTION

INTRODUCTION

The Southern Appalachian Coal Region is one of 12 coal production regions established in 1979 by the United States Department of the Interior (DOI) in association with a Federal coal management program. The program is fully described in the Final Environmental Impact Statement: Federal Coal Management Program, in the Federal Regulations at 43 CFR 3400, and in Federal Coal Management Program-A Narrative Description. These documents are available from the Bureau of Land Mangement, Office of Coal, Tar Sand and Oil Shale, Department of the Interior, 18th and C Streets, N.W., Washington, D.C. 20240 (telephone (202) 343-4537).

This environmental impact statement (EIS) analyzes alternative levels of Federal coal leasing in the region beginning in mid-1984.

PURPOSE AND NEED FOR LEASING IN THE REGION

The purpose of this action is to evaluate a second round of competitive leasing of Federal coal in the Southern Appalachian Region, Alabama Subregion. The first round, completed in 1982, involved the development of leasing targets for the Subregion, a regional Environmental Impact Statement (EIS) for coal leasing, and three lease sales. Continued leasing of Federal coal coupled with development of existing Federal coal leases is expected to stimulate production and use of coal to meet national energy requirements. The overall coal leasing program as applied in Alabama is described in the Final Southern Appalachian Regional Coal EIS (BLM, 1980).

The following discussion summarizes the overall Federal Coal Leasing Program. It is followed by a discussion of events specific to the Southern Appalachian Coal Region which have led to the preparation of this EIS.

Federal coal is leased based on the Federal land use planning process which considers input from State, industry and public sectors. Amounts leased are based on a policy of leasing to meet the projected need of industry for coal reserves.

Bureau of Land Management (BLM) land use planning documents are the sources relied upon in the initial process of identifying areas suitable for further consideration for coal leasing. Criteria used to designate these lands are found in Section 522 of the Surface Mining Control and Reclamation Act of 1977 (SMCRA) and further detailed in 43 CFR 3461

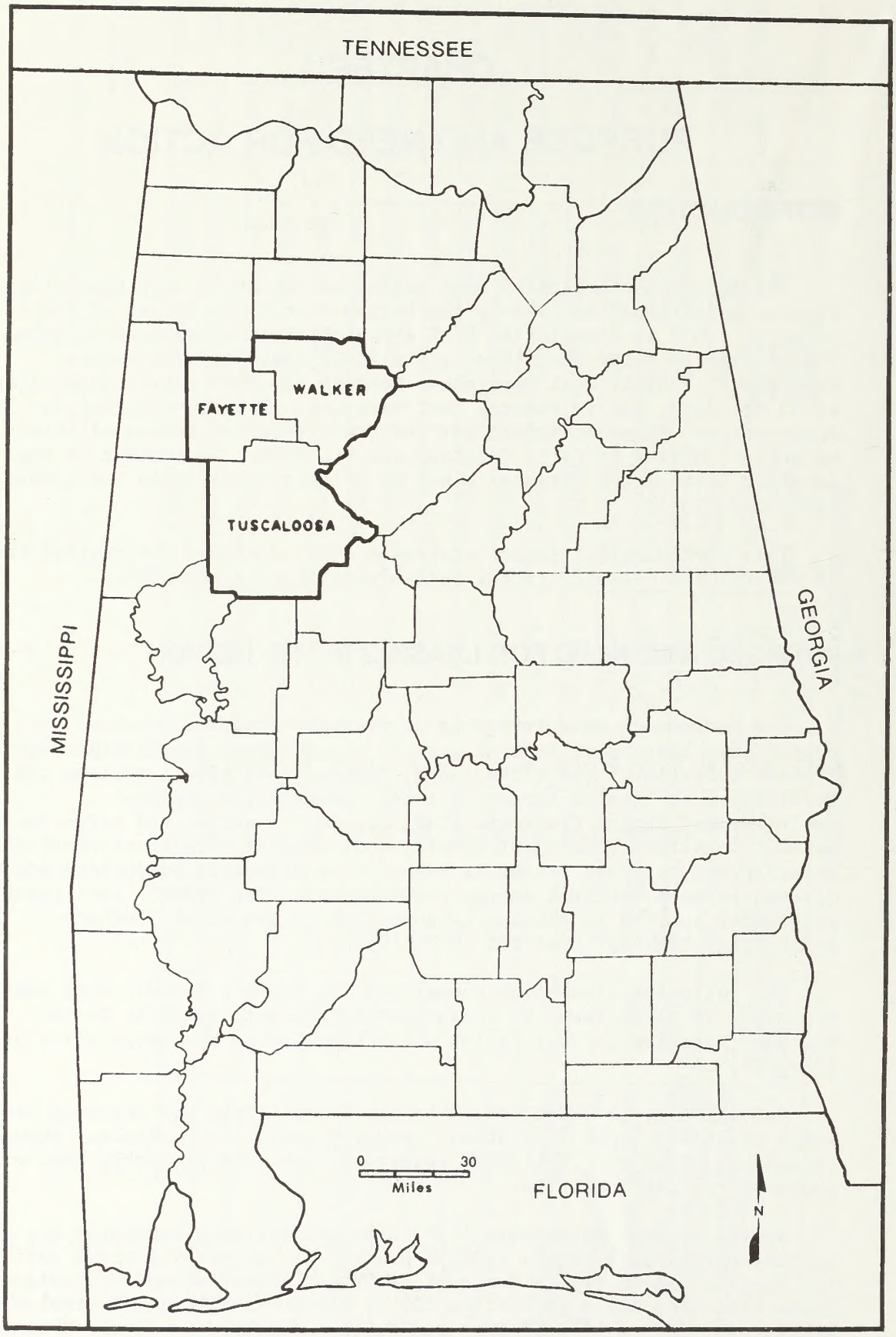


Figure 1-1. Alabama Sub-Region of the Southern Appalachian Coal EIS Region

(Regulations Pertaining to Coal Management, Federally Owned Coal: Federal Lands Review-Unsuitability for Mining).

After completion of land use planning, BLM issues a call for industry expressions of interest in coal leasing for those areas in the region found suitable for further consideration. A Regional Coal Team (RCT), comprised of Federal officials and State Governors' representatives, is formed to oversee the leasing process and make recommendations to the Director of BLM regarding leasing actions and regional leasing levels. A series of public meetings are held to consider each of the following steps in the process. The expressions of industry interest and other geologic and mining data are used by the BLM, formerly Minerals Management Service (MMS), to delineate specific tracts for potential leasing. BLM prepares tract delineation reports which indicate annual production potential, expected mining methods, employment requirements, tract size, and other salient data. This information is used to prepare a Tract Profile Report for each tract. The RCT then ranks the tracts based on coal economics, environmental impacts, and socioeconomic impacts. The RCT also formulates preliminary alternatives consisting of different combinations of tracts to make up varying levels of production. An EIS is then prepared which analyzes the environmental impacts of the aternatives selected.

The RCT, utilizing the EIS conclusions and the comments received during the public review periods, formulates a final recommendation regarding the competitive coal lease sale.

REVIEW OF THE REGIONAL PROGRAM TO DATE

RELATIONSHIP TO LAND USE PLANNING

The Alabama Subregion of the Southern Appalachian Region is one of the eight areas in which the BLM is administering the Federal Coal Management Program. Comprehensive land use planning is mandatory prior to any decision to lease Federal coal on a regional scale (43 CFR 3420.1-5). In July 1979, the North Central Alabama Land Use Analysis (LUA) was approved by the BLM. This LUA constitutes comprehensive land use planning for Federal minerals completely overlain by private surface ownership (split estate ownership), located in the counties of Fayette, Walker, Tuscaloosa, and the northwestern part of Jefferson County. (LUA area was reduced to three counties in 1982 when Jefferson County was placed under lease by applicaton procedures). See figure 1-1, Alabama Sub-Region of the Southern Appalachian Coal EIS Region. The information in the LUA was updated in 1982 in preparation for this second round of activity planning.

The LUA is required to be compatible with existing state and local plans. The land use plans for the Alabama Subregion are policy statements by the West Alabama Planning and Development Commission and the Birmingham Regional Planning Commission concerning the future use of lands. Urban areas, generally, have adopted and enforced building codes,

subdivision regulations, and zoning ordinances. This is not true for the counties involved. The lands carried forward for further consideration for mining in the LUA are compatible with these local and state land use plans and controls.

Although the area of FMO concentration is not zoned, use of the land for mining is controlled in various ways. The Alabama Department of Environmental Management (ADEM) has regulated use of drainage basins of municipal water impoundments. An even larger basin around the same impoundment is subject to regulation on a case-by-case basis and all surface mining must be permitted by ADEM. Regulations of the Alabama Surface Mining Commission (ASMC) and the Office of Surface Mining Reclamation and Enforcement (OSM) contain numerous provisions and requirements related to present and future land uses with respect to coal mining operations.

RELATIONSHIP TO ACTIVITY PLANNING

Following approval of the LUA, or in this case the LUA-update, the BLM issued a call for industry expressions of interest in leasing those areas found acceptable for further consideration. Expressions of interest were received during the 60-day period beginning on May 21, 1982, and ending on July 19, 1982. Non-proprietary information provided to the BLM in response to the call is on file with the Eastern States Office of BLM. For further information, contact Eastern States Director, 350 South Pickett Street, Alexandria, Virginia 22304 (telephone: (703) 235-2833).

The steps of the leasing process following the call are under the purview of the Southern Appalachian RCT. The team was organized on October 16, 1979. It includes as its members the Chief of the BLM Division of Coal, Tar Sands and Oil Shale, the BLM Eastern States Director, and the representative of the Governor of Alabama.

In this second round of activity planning, the RCT has held three public meetings open to public scrutiny to consider options, make decisions, and provide guidance in the process which led to the publication of this document. Two more meetings will be held before this document is final. Records of the meetings and correspondence to and from the Team are available for review at the Jackson District Office of BLM.

The next step in activity planning after the call for expressions of interest is tract delineation. This was accomplished by a team of MMS and BLM staff members, using the data from the expressions of interest, as well as other geologic and mining sources. Four underground and 12 surface tracts were delineated. The tract delineation summary reports and other related material are on file in the Jackson District Office of BLM. These reports indicate the estimated annual production of each tract, type of mining, probable end use, acreage disturbance, and other salient data. This information was used to develop a site-specific environmental impact analysis (SSA) and an abstract for each tract. These analyses estimate on-site impacts to various components of the

human environment. They are combined with the tract delineation reports to form Tract Profile Reports. Complete tract profile reports, as well as abstracts, are available for review at both the Eastern States and Jackson District Offices of BLM.

The information from the site-specific analyses was used for several subsequent steps. The RCT used it to develop ranking factors in the general categories of coal economics, impacts on the natural environment, and socio-economic impacts. The following were the critical factors selected by the RCT, and used in ranking the 16 delineated tracts.

Environmental	Coal Economics	Socioeconomics
-Surface Water	-Tract Potential for Development	-Personal Income
-Groundwater	-By-pass	-Severance Tax
-Productivity	-SBA	-Federal Royalty
-Wildlife	-Industry Interest	-Abandoned Mine Reclamation Fund
-Aquatic Life	-Total Tons Recoverable	-Surface Owner Consent
	-Total Federal Tons Recoverable	

Another factor which affects tract ranking is the leasing level adopted for the region. The BLM Lead State Director must consult with the governor of the state affected in this process. The leasing level document is then offered for public review before it is transferred through the BLM Director to the DOI Secretary for approval.

As regional production levels are not sufficient to allow the use of the National Coal Model, other factors and methodology had to be utilized in the projection of a leasing level. These include projections by the: 1) inventory method using Reserve-to-Production ratios of 2.0 to 3.0 and a Federal share of production from 5 to 10 percent, and 2) contracting rate method assuming that 75 percent of the current and future production will be under long-term contract with a Federal share of production of from 5 to 10 percent. Also taken into consideration were the expressions of interest, an analysis of past sales, and the existing coal market. The present coal market in Alabama is characterized by an industry-wide slump due to the recent slow economy. Demand for metallurgical and thermal coals is very weak, both domestically and internationally. The outlook for the future holds promise for improvement due to increased, but limited, demands for electricity and steel. On February 14, 1983, the Deputy Assistant Secretary of Land and Water Resources, after consultation with Governor Wallace, confirmed the designation of the initial range of 42 to 117 million tons of Federal recoverable resources.

On February 9, 1983, the RCT met to rank the 16 delineated tracts using the factors listed above. They were ranked into low, medium, and high categories of desirability for leasing.

Data from the site-specific analyses and from the tract delineation reports also were used to prepare cumulative analyses of the regional environmental impacts from leasing the tracts under each of the combinations selected. These analyses researched offsite impacts which

might result from the simultaneous development of the tracts in each combination. These analyses address such diverse environmental components as wildlife populations, water resources, and community infrastructure.

Six alternatives were discussed by the RCT; however, the decision was made to include only four in this document. The rationale for this decision is continued in the introduction to chapter 2.
The alternatives considered herein are:

Alternative One - (No Action) -- No competitive leasing other than the 15 tracts already under lease--1995--55.4 to 66.7 million tons of coal mined.

Alternative Two - Leasing of All High Ranked Tracts (4 surface and 3 underground) -- 109.07 million tons of recoverable Federal Coal Resources.

Alternative Three - Leasing All Surface Tracts and All High Ranked Underground Tracts (12 surface and 3 underground)-- 112.63 million tons of recoverable Federal Coal Resources.

Alternative Four - Leasing All Tracts (12 surface and 4 underground) -- 128.53 million tons of recoverable Federal Coal Resources.

Subsequent to the meeting, the RCT selected Alternative Three as the Preferred Alternative to be addressed by this EIS.

One final note needs to be made concerning the decision-making process leading to the lease sale scheduled for May 22, 1984. The Secretary of the Interior's decision on a course of action is not limited solely to the alternatives presented in this EIS. He may, through the use of his discretionary authority, develop additional alternatives that are intermediate in magnitude with respect to those analyzed in the EIS. These intermediate alternatives can be developed through changes in tract boundaries, changes in the tract combinations, and changes in the lease sale schedule. In no event, however, will new tracts or additional tonnage be added without further study. These would be based upon any of several factors: the views of the Governor of Alabama as determined by formal consultation, the results of the EIS, the recommendations of the Southern Appalachian RCT, the results of coordination with other Federal agencies, and other pertinent data.

RELATIONSHIP TO FIRST ROUND EIS AND LEASE SALE

The first round EIS for the region was completed under the guidance of the RCT in January 1981. They met on February 17, 1981, and made a final recommendation of the tracts to be offered for lease in the first round and a proposed sale schedule. Three sales were held: June 1981, December 1981, and September 1982. As a result of the sales, 8 tracts have been leased and 5 are being processed (for a total of 13). Figure 2-2 shows these tracts.

PURPOSE AND NEED FOR ACTION

There is one Federal lease presently under production which is currently yielding less than 100,000 tons annually. Additionally, there is one emergency lease and 13 competitive sale leases mentioned above that are currently not in production. Total leased in-place recoverable Federal tonnage for the above tracts is approximately 50 million tons.

LEASING ON APPLICATION AFTER SECOND ROUND

Federal coal ownership in the eastern U.S. is usually in small, scattered tracts which renders Federal regional coal sales impractical in many areas. In these eastern areas, leasing by application is the only method by which industry can obtain Federal coal. These applications can be submitted without recourse to Federal emergency lease requirements. Only in Alabama were there sufficient concentrations of unencumbered Federal coal reserves to warrant employing the regional analysis and sale methods of the Federal coal management program.

In Alabama, a swath containing approximately 71,000 acres of Federal coal rights occupies the western portion of the coal mining area of the Warrior Basin. About 10,000 acres of Federal coal have been leased, with an additional 32,000 acres delineated into mining tracts. Due to the method of leasing by coal group, some acreage may contain up to three leased or delineated tracts.

Federal coal leasing in Alabama has reached a pivotal point. The best available geologic evaluations show that most of the known Federal areas of economic coal occurrence (both underground and surface) are either leased or delineated. While data gaps do exist, there is adequate data coverage of the areas of Federal coal to warrant these evaluations. Approximately 6,000 acres of Federal coal rights not in a lease or in a delineated tract have some potential for future surface coal leasing. These marginal coals were not delineated into tracts due to the scantness of the coal, the amount of overburden, or previous mining. About 48,000 acres of Federal coal rights have an uncertain potential for future surface coal leasing. Existing data is sufficiently scattered to have missed some small areas of surface minable coal even though most of this area must be viewed as having no potential for future leasing.

Approximately 54,000 acres of Federal coal rights have an uncertain potential for future underground coal leasing. Existing data is sufficiently scattered to have missed some small areas of underground minable coal even though most of this area must be viewed as having no potential for future leasing. An additional complicating factor is the extreme unlikelihood of development of small, isolated pockets of underground coal, using available technology. If the coal is not adjacent to an ongoing operation, it will not be mined.

Federal coal in Alabama is a rapidly diminishing resource. Through the processes of the Federal coal management program, the existing deposits of economically-minable surface and underground coal have been identified and delineated. Some of the delineated tracts have been leased, as will others in future sales. However, outside of these

delineated areas there is little potential for future leasing. Remaining blocks of Federal coal in Alabama are small and isolated and do not lend themselves to the regional analysis and sales program. The remaining Federal coal will be better managed on a site-specific, reactive basis through the existing lease by application procedures used in the remainder of the eastern U.S.

ISSUES AND AREAS OF CONCERN

Government agencies and the public participated in the scoping process by providing information, making suggestions, and raising questions concerning the issues involved.

The main environmental concerns that have been expressed thus far in this round of activity planning are the same as those expressed during of the first round. The principal concerns are the impacts of surface mining on water quality and availability. In the February 1983 RCT meeting, the City of Tuscaloosa indicated its concern for potential impacts on municipal water supplies stored in Lakes Tuscaloosa, Nicol, and Harris. Other concerns expressed in the first EIS include: 1) the possibility of incomplete or inadequate reclamation, 2) the fear of the loss of wildlife habitat, 3) the impacts of coal trucks on the road system, 4) the potential loss of highly-productive farmland, 5) the possible impacts of subsidence from underground mining on buildings, 6) the uncertainty about surface owner rights and prerogatives, 7) the impact of the legally required minimum royalty rate, and 8) the technical problems caused by seam-by-seam leasing and Maximum Economic Recovery (MER) determination. These considerations are addressed in the text where appropriate. Factor 8 will be addressed after the announcement of the regional lease sale schedule, as provided for in 43 CFR 3422; and Factor 7 will be resolved on a case-by-case basis after the leases are issued. Final concerns which evolved out of the February 1983 RCT meeting were the considerations of public body set-asides, of which tracts are delineated in areas where BLM has received emergency by-pass application, and of leasing by application after completion of the next round of lease sales (as discussed above).

Three expressions of industry interest were received. One expression requested a public body set-aside tract. These expressions were all for surface coal and were broad enough that all of the delineated surface tracts fall within an area where interest has been expressed. The RCT took these expressions into consideration when ranking the tracts, and designated two tracts as public body set-asides.

The regulatory changes outlined below, while they are not issues or concerns, do affect the mitigation or alleviation of the issues and concerns discussed above. The OSM permanent regulations were suspended during the first EIS as a result of legal challenges. In January 1983, OSM published an EIS covering proposed revisions to permanent program regulations.

Since the first EIS was completed, ASMC finalized regulations to cover surface coal mining and reclamation operations. The regulations, completed on December 18, 1981, were approved by the Secretary of the Interior on May 20, 1982, subject to revisions, and received final approval on August 4, 1982. These regulations, together with those of OSM, and ADEM, serve as a framework for the mitigating measures discussed in chapter 4 of this EIS.

DATA INCONSISTENCIES

The next coal lease sale for the Alabama Subregion is scheduled for mid-1984. In the analysis of alternatives, it has been assumed that all surface mines will start up in 1985 and that all underground production will begin in 1990. It is understood that these start-up dates are unrealistic, both in terms of number of mines and the time required to process a lease and mine plan. However, these assumptions were made in order to portray the maximum possible impacts which could result from leasing Federal coal. In addition, the application of the best available mathematical model to predict hydrologic impacts requires that the mine start-ups be simultaneous, given the EIS preparation time constraints.

There are some minor inconsistencies between the acreage disturbed figures used in these analyses and the projected acreage disturbed figures provided for the tracts in the Tract Delineation Reports. These are mainly due to rounding and differences in measurement of tract areas.

Coal and water resource data are continuously being augmented. Coal reserve figures may be revised.

Unless otherwise indicated, projections of cumulative impacts have been carried only to the Year 1995. This is somewhat at variance with the BLM projected end of life for several of the mines. This was done primarily because there is a great deal of uncertainty about the projected level of mining which will occur in the region, regardless of any new Federal leasing. In addition, many baseline data projections have used that date as a convenient stopping point. In all cases where the staff members were able to arrive at reasonable impact projections to the end of the various mine lives, they did so. This procedure provides a clear view of the incremental differences in impact levels between the alternatives.

CHAPTER 2

ALTERNATIVES INCLUDING THE PROPOSED ACTION

INTRODUCTION

Six alternatives were discussed by the Regional Coal Team (RCT); however, the decision was made to include only four in this document. One alternative would have included only the four underground tracts, but it was dropped because the RCT decided it would not be feasible for the Alabama coal industry, which is dominated by surface mining companies. The RCT's evaluation of the underground only option revealed the following points:

1) Due to the diversity inherent between undergound coal mining and surface coal mining, environmental assessment of effects requires separate analysis. These analyses are then melded to form the alternative's cumulative evaluation. This process means that the environmental assessment of an undergound only option exists as a discrete portion of the evaluation of Alternative Four.

2) An underground only option would not address the expressed needs of the Alabama coal industry (all expressions of industry interest were for surface minable coal only). In addition, this option would probably result in two immediate applications (under lease by application procedures for tracts of Federal surface coal covered by the expressions of interest.

3) An underground only option would not address the expressed need to make available surface minable Federal coal for public body set asides.

4) The depth and location of the underground tracts, as well as the surrounding private coal ownership, would prevent any small business entities from bidding. As stated above, Alabama's coal industry is dominated by the smaller operators.

5) Further rationale involve the weakened regional and international markets and the need for large front-end investment, which causes the underground only option to be the weakest in terms of future lease sales. It would also delay actual production of Federal coal due to the lengthy time periods involved in development of underground mine plans and construction of mine shafts and facilities.

The other alternative that was dropped would have added one underground tract to Alternative Two. It was dropped from discussion because the annual production, total in-place Federal coal resources, and recoverable Federal coal resources figures would each be within a few million tons of those for Alternative Four (leasing all tracts). Three characteristics of the additional underground tract also provide

rationale for dropping this alternative from further consideration. They are: 1) the tract is considered essentially captive (i.e., only developable by one company) with development unfeasible in the near future; 2) the coal is of questionable quality; and 3) the scattered nature of Federal Mineral Ownership (FMO).

This chapter provides a summary of each of the four Federal coal leasing alternatives, including the significant environmental impacts or issues inherent to the alternatives. The Southern Appalachian Coal Region, Alabama Subregion, is shown on figure 1-1. Figure 2-1 shows the major concentrations of FMO within the Alabama Subregion.

Each alternative is described by identifying the number and type of tracts, the total Federal coal resources, and the annual production. Also given are special characteristics of specific tracts (e.g., by-pass, public body set-aside).

Environmental impacts are summarized in a two-fold manner. First, table 2-1 is a summary matrix that compares the magnitude and significance of the major cumulative environmental impacts of each alternative. The impacts displayed are for the year 1995 and the figures given for Alternative One (no action) reflect baseline data for that year. The figures for the remaining alternatives have been added to the baseline figures. Secondly, a narrative impact assessment focuses on those significant impacts or issues (if any are anticipated) that clearly define the comparisons and contrasts among alternatives, or which are of special interest. A detailed discussion of the impacts is contained in chapter 4.

The issues contained in this section have been defined by the results of the environmental consequences analysis (ch. 4), and the scoping process (40 CFR 1501.7). Chapter 4 describes in detail all environmental impacts, both beneficial and adverse, that result from implementing any of the alternatives. Table 2-1 reveals several significant negative environmental impacts for all alternatives, with Alternatives Three and Four accounting for most of the predicted increase above the baseline condition. A number of positive and significant socio-economic impacts are identified under all alternatives, being most significant for Alterantives Three and Four. These potential impacts are discussed in detail in chapter 4. Those impacts that do not sharply define a comparison between alternatives are not analyzed in this section, unless identified in the scoping process as being of particular concern or controversy. Those environmental impacts that are significant and which provide a clear basis for choice by the decision-maker and the public are presented.

Results of the scoping process (described in detail in ch. 1) revealed issues or environmental concerns that are of special interest to the public and Federal, state, and local agencies. These issues are included in this section whether or not they were found significant in the analysis contained in chapter 4.

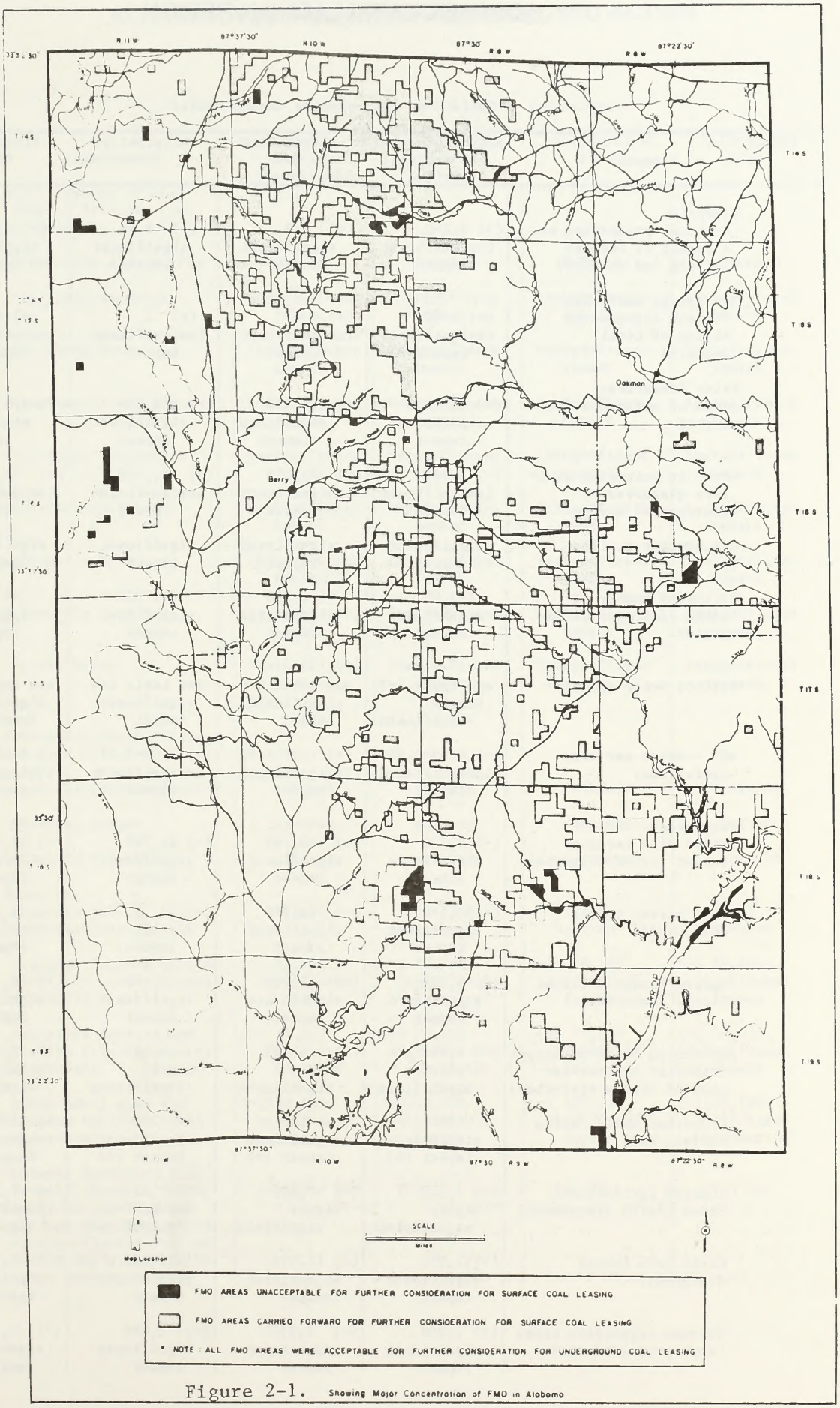


Figure 2-1. Showing Major Concentration of FMO in Alabama

Table 2-1. Alternative Impact Matrix

Element	Alternative One (no action) (Baseline)	Alternative Two	Alternative Three	Alternative Four
Minerals: New coal production as a result of Federal leasing (mm tons/yr)	(+) 0.2-0.5 insignificant impact	(+) 6.9 significant impact	(+) 8.47 significant impact	(+) 10.57 significant impact
Net Energy Analysis: Percent consumed by mining of total produced	(+) 1-2% insignificant impact	(+) 1 insignificant impact	(+) 2 insignificant impact	(+) 2 insignificant impact
Water Resources: Acres of watershed disturbed	(-) 123,000 significant impact	(-) 125,750 significant impact	(-) 128,310 significant impact	(-) 128,560 significant impact
Acres of potential aquifers disturbed by underground mining	(-) 7,380 insignificant impact	(-) 31,455 insignificant impact	(-) 51,720 insignificant impact	(-) 72,620 insignificant impact
Groundwater quality	significant impact	significant impact	significant impact	significant impact
Estimated number of wells destroyed or impacted.	(-) 69 significant impact	(-) 230 significant impact	(-) 338 significant impact	(-) 386 significant impact
Surface water quality[1]	see table 2-3 highly significant	see table 2-6 significant impact	see table 2-8 significant impact	see table 2-10 significant impact
MGD - Water use mine operations.	(-) 0.95-0.99 insignificant impact	(-) 1.95-1.99 insignificant impact	(-) 3.03-3.07 insignificant impact	(-) 4.60-4.68 insignificant impact
Vegetation: Mixed pine hardwood forest (acres disturbed)	(-)59,710 significant impact	(-) 60,785 significant impact	(-) 62,760 significant impact	(-) 62,760 significant impact
Pine Forest (acres disturbed)	(-)30,560 significant impact	(-) 31,195 significant impact	(-) 32,325 significant impact	(-) 32,325 significant impact
Upland hardwood forest (acres disturbed)	(-) 6,090 significant impact	(-) 6,095 significant impact	(-) 6,170 significant impact	(-) 6,170 significant impact
Bottomland hardwood forest (riparian habitat included) (acres disturbed)	(-) 6,360 highly significant	(-) 6,385 highly significant	(-) 6,405 highly significant	(-) 6,405 highly significant
Disturbed lands (acres redisturbed)	180 significant impact (+)	180 significant impact (+)	200 significant impact (+)	200 significant impact (+)
Cleared agricultural lands (acres disturbed)	(-) 7,190 highly significant	(-) 7,205 highly significant	(-) 7,215 highly significant	(-) 7,215 highly significant
Clear cuts (acres disturbed)	(-)11,910 significant impact	(-) 11,910 significant impact	(-) 12,320 significant impact	(-) 12,320 significant impact
Unknown vegetation types (underground tracts)	(-) 1,000 significant impact	(-) 2,050 significant impact	(-) 2,050 significant impact	(-) 2,400 significant impact

Table 2-1. Alternative Impact Matrix (continued)

Element	Alternative One (no action) (Baseline)	Alternative Two	Alternative Three	Alternative Four
Other Species of High Federal Interest (see chapter 4):				
-flattened musk turtle	Unknown	Unknown	Unknown	Unknown
-American woodcock	insignificant impact	insignificant impact	insignificant impact	insignificant impact
-mourning dove	insignificant impact	insignificant impact	insignificant impact	insignificant impact
-red-headed woodpecker	insignificant impact	insignificant impact	insignificant impact	insignificant impact
-pileated woodpecker	insignificant impact	insignificant impact	insignificant impact	insignificant impact
-eastern bluebird	insignificant impact	insignificant impact	insignificant impact	insignificant impact
-Cooper's hawk	insignificant impact	insignificant impact	insignificant impact	insignificant impact
-Bewick's wren	insignificant impact	insignificant impact	insignificant impact	insignificant impact
-green heron	insignificant impact	insignificant impact	insignificant impact	insignificant impact
Endangered Species (see chapter 4):				
-red-cockaded woodpecker	unknown	unknown	unknown	unknown
-Eastern cougar	unknown	unknown	unknown	unknown
-Bachman's warbler	unknown	unknown	unknown	unknown
Wildlife:				
Riparian habitat (acres disturbed)	unknown	(-) 25 unknown	(-) 45 unknown	(-) 45 unknown
Big-game feeding habitat (deer and turkey) (acres disturbed)	(-) 91,190 significant impact	(-) 92,760 significant impact	(-) 96,195 significant impact	(-) 99,840 significant impact
Squirrels denning and feeding areas (acres disturbed)	(-) 72,815 significant impact	(-) 75,200 significant impact	(-) 76,730 significant impact	(-) 78,935 significant impact
Other small game and nongame habitat (acres disturbed)	(-)123,000 significant impact	(-)125,805 significant impact	(-) 129,440 significant impact	(-)129,790 significant impact
Cultural Resources (CR)[2]: Total # known CR which could be impacted by surface and underground mining (figures reflect entire surface within tract boundaries)	(-) over 114	(-) 29	(-) 29	(-) 29

Table 2-1. Alternative Impact Matrix (continued)

Element	Alternative One (no action) (Baseline)	Alternative Two	Alternative Three	Alternative Four
Surface tracts: Total # known CR within entire tract boundaries	(-) 14	(-) 6	(-) 11	(-) 11
Underground tracts: Total # known CR within entire tract boundaries (areas of impact to surface cannot be determined until mine plan submission)	(-) 12	(-) 24	(-) 24	(-) 24
Recreation:				
Urban	insignificant impact	insignificant impact	insignificant impact	insignificant impact
Dispersed (loss of quality)	insignificant impact	insignificant impact	insignificant impact	insignificant impact
Visual Resources	insignificant impact	insignificant impact	insignificant impact	insignificant impact
Land Use:				
Direct land use (acres disturbed)	123,000 insignificant impact	125,804 insignificant impact	130,234 insignificant impact	129,584 insignificant impact
Policies and plans	insignificant impact	insignificant impact	insignificant impact	insignificant impact
Soils:				
Acres disturbed	123,000 significant impact	124,754 significant impact	128,184 significant impact	128,184 significant impact
Underground tracts disturbed acreage	-- insignificant impact	1,050 insignificant impact	1,050 insignificant impact	1,400 insignificant impact
Total acres disturbed	123,000 significant impact	125,804 significant impact	130,234 significant impact	129,584 significant impact
Socioeconomics:				
Personal income mining (in million $)	(+) 819.5 highly significant	(+) 888.4 highly significant	(+) 890.8 highly significant	(+) 915.5 highly significant
Total (in million $)	(+) 10,626.6 highly significant	(+) 10,688.2 highly significant	(+) 10,689.6 highly significant	(+) 10,701.2 highly significant
Employment:				
Direct	(+) 14,332 highly significant	(+) 16,697 highly significant	(+) 16,723 highly significant	(+) 17,596 highly significant
Total	(+) 235,232 highly significant	(+) 238,662 highly significant	(+) 238,753 highly significant	(+) 239,943 highly significant
Severance tax (in million $)	(+) $1.1 significant impact	(+) $1.96 significant impact	(+) $2.07 significant impact	(+) $2.08 significant impact
Federal royalty (in million $)	(+) $3.7 significant impact	(+) $9.2 significant impact	(+) $9.7 significant impact	(+) $11.3 significant impact
Population in-migration for alternatives (%)	(+) 7%	(+) .02 insignificant impact	(+) .01 insignificant impact	(+) .20 insignificant impact

Table 2-1. Alternative Impact Matrix (continued)

Element	Alternative One (no action) (Baseline)	Alternative Two	Alternative Three	Alternative Four
Infrastructure (housing, schools, health facilities, police, fire, water, sewer service, solid waste)	significant impact	insignificant impact	insignificant impact	insignificant impact
Transportation:				
Increased average daily traffic	insignificant impact	insignificant impact	insignificant impact	insignificant impact
Increased traffic congestion	No. insignificant impact	No. insignificant impact	No. insignificant impact	No. insignificant impact
Increased accidents	insignificant impact	insignificant impact	insignificant impact	insignificant impact
Increased rail traffic (in millions)	(-) 2.261 significant impact	(-) 2.829 significant impact	(-) 3.472 significant impact	(-) 4.334 significant impact
Increased barge traffic (in millions)	(-) 1.344 insignificant impact	(-) 1.449 insignificant impact	(-) 1.779 insignificant impact	(-) 2.220 insignificant impact
Increased barge congestion	No insignificant impact	No insignificant impact	No insignificant impact	No insignificant impact

[1] Identified in scoping process
[2] A total of 29 known CR properties, as well as an unknown number of currently unrecorded properties, could be impacted. Significance of impacts to CR cannot be fully evaluated until completion of required inventories. (See table 4-6)
[3] (-) Negative impact
[4] (+) Positive impact

REQUIRED AUTHORIZATIONS

The development of Federal coal resources is influenced by numerous laws and regulations imposed by Federal, state, and local agencies and authorities. Applicable Federal laws include the Mineral Leasing Act of 1920 (MLA), Federal Coal Leasing Amendments Act of 1976 (FCLAA), the Federal Lands Policy and Management Act of 1976 (FLPMA), and the Surface Mining Control and Reclamation Act of 1977 (SMCRA).

Each lease operator is required to submit a permit application package and resource recovery and protection plan as set forth in 30 CFR 740.13(b). The State of Alabama has been given primary responsibility for administering and enforcing the provisions of the Act and of Chapter VII, 30 CFR on private lands. Before the state assumed this responsibility, it developed an OSM-approved state program pursuant to the Act, and a State/Federal Cooperative Agreement, in accordance with 30 CFR part 745. The program complies with relevant Federal laws and regulations and any state laws or regulations more stringent than Federal requirements. OSM still has privacy responsiblity with regrd to FMO, as there is not a Federal-State cooperative agreement in force at this time.

ASSUMPTIONS

The analyses in this statement address impacts related to development of all of the minable coal in each tract as described in the Tract Delineation Summary reports. This EIS presents the cumulative impacts associated with leasing Federal coal in the Subregion. The analysis in each alternative is based on the assumption that all tracts in that alternative will be leased.

The mining units (i.e., the delineated tracts which include much privately-owned coal) are assumed to be the mining units which would be developed as a result of leasing the Federal coal contained in each tract. This assumption causes an overestimation of the actual impacts of leasing the Federal coal for the following reasons: 1) the scattered configuration of Federal coal ownership, 2) the intermingled nature of industry and non-industry surface and mineral holdings, and, 3) the very small areas typically surface-mined in Alabama.

The environmental impact analyses are predicated on the assumption that all relevant state and Federal laws and regulations pertaining to coal mining and related activities will be followed and enforced.

Throughout these analyses, there is an implicit recognition that the environmental impacts of surface mining in this region are generally much larger than the impacts from underground mining (Haynes, et al., 1979). The reader will note a heavier emphasis on the impacts of surface mining. This is for several reasons. Firstly, the exact site-specific impacts of mining the underground tracts cannot be precisely addressed until after a lease sale and mine plan submission. Only then can the locations and impacts of related surface effects be identified and mitigated. Secondly, underground coal mining has been an important industry in this

region for more than 100 years and surface mining for more than 40 years. In that time, it has been demonstrated that, in this area, underground coal mining is much less environmentally disruptive than is surface mining (BLM, 1979).

ALTERNATIVE ONE (NO ACTION)

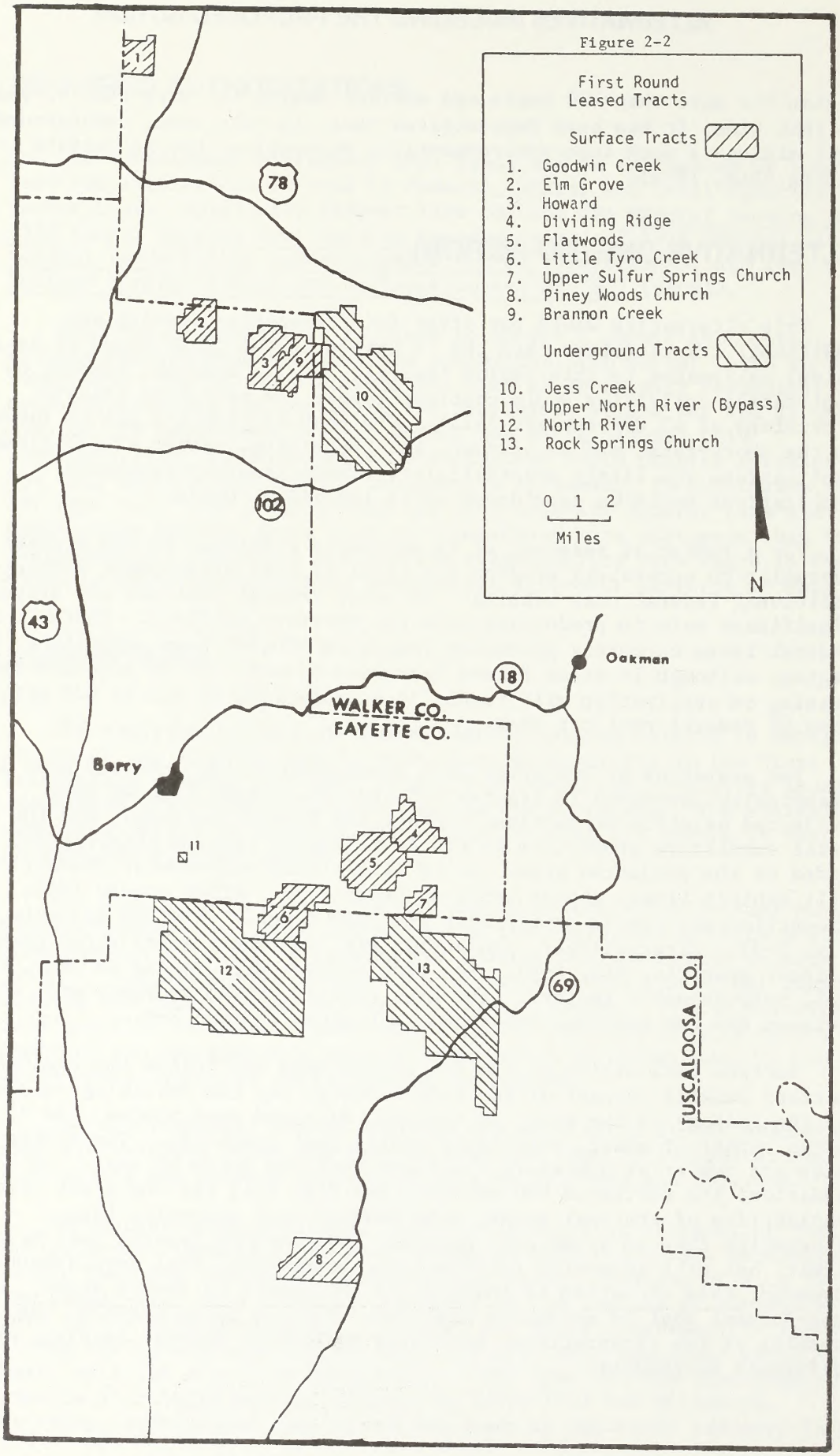
This alternative would not offer for competitive leasing any additional tracts (other than the 13 leased in the first round of lease sales) delineated in this region (see fig. 2-2). However, leasing by application activities would continue (under the emergency leasing provisions of 43 CFR subpart 3425). One such application can be foreseen in the short-term, and an unknown, but increasing, number of additional applications are likely eventualities. These industry-generated applications would be considered on an individual basis.

For a number of reasons, it is extremely difficult in the Alabama Subregion to accurately predict the level of coal development without additional Federal coal leasing. To date, Federal coal has not played a significant role in production from the Warrior Coalfield. There is one Federal lease currently producing less than 100,000 tons annually in the region, although 14 other leases have been issued. It is possible that leasing on application will result in a production of 0.2 to 0.5 million tons of Federal coal per year.

Two scenarios of projected coal production in the 3-county area are graphically portrayed in figures 2-3 and 2-4. These figures show projected baseline production (without new Federal leasing), and the total cumulative production as the four Federal leasing alternatives are added to the projected base. It is likely that non-Federal production will exhibit linear growth until at least 1990. After around 1990, production may remain static near the 1990 level. (Plateau scenario, fig. 2-3). Alternatively, production may continue its projected growth (Linear scenario, fig. 2-4). The true outcome will depend on many, as yet, unforeseeable factors. The true rate of growth probably will lie between the two extremes expressed in figures 2-3 and 2-4.

Surface coal mining in the EIS region does not follow the typical pattern usually thought of for this industry for the following reasons: 1) the geology of the area, 2) the well dveloped road system, and 3) the large number of small, relatively mobile coal operators. The number of pits and number of operators fluctuate with the price of coal. In addition, the scattered FMO pattern (see fig. 2-1) and the great local variability of the coal seams, make Federal coal generally less attractive than in other coal regions. Not leasing Federal coal may limit, but will generally not preclude, non-Federal coal development. However, this situation is changing as the supply of easily mined, non-Federal coal is gradually depleted. For the above reasons, the results of the alternatives, including no further Federal leasing, are difficult to predict.

Figure 2-2


First Round
Leased Tracts
Surface Tracts
1. Goodwin Creek
2. Elm Grove
3. Howard
4. Dividing Ridge
5. Flatwoods
6. Little Tyro Creek
7. Upper Sulfur Springs Church
8. Piney Woods Church
9. Brannon Creek
Underground Tracts
10. Jess Creek
11. Upper North River (Bypass)
12. North River
13. Rock Springs Church
0 1 2
Miles
N
78
102
43
18
69
Oakman
WALKER CO.
FAYETTE CO.
Berry
TUSCALOOSA CO.

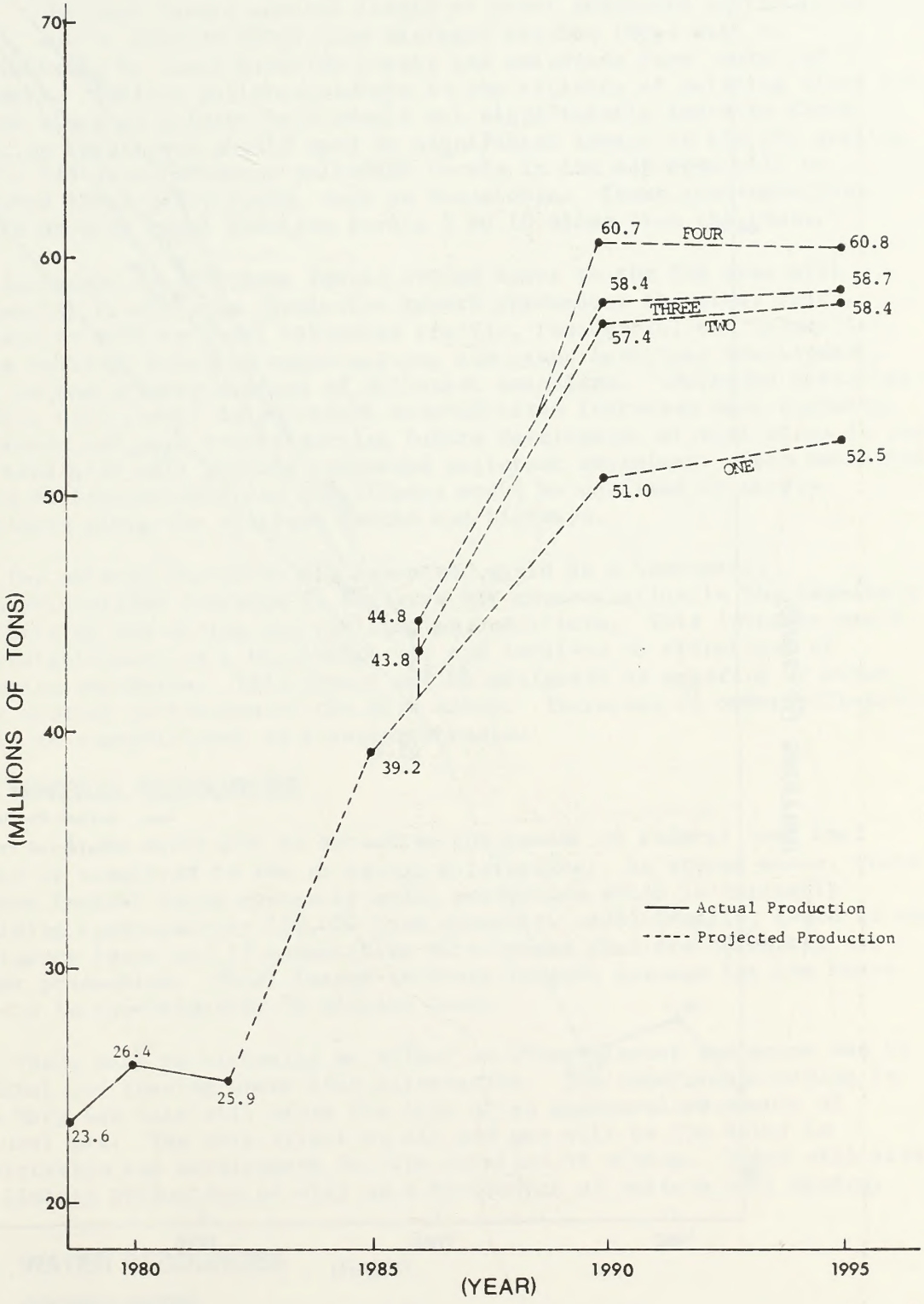


Figure 2-3. Projected Coal Production, by Alternative, in the Three County Area. Plateau Scenario (from Geological Survey of Alabama, 1982; MMS, 1982)

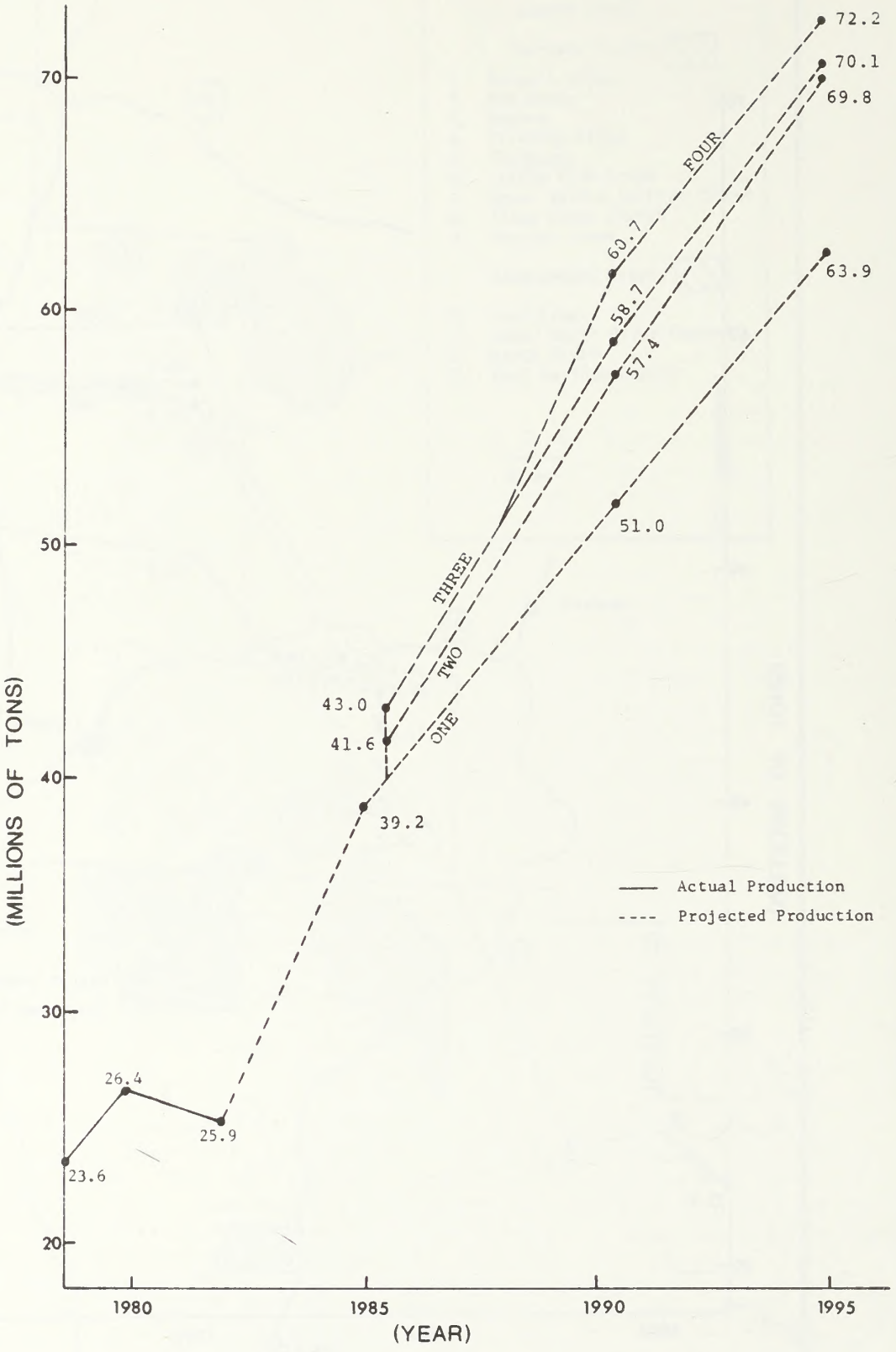


Figure 2-4 Projected Coal Production, by Alternative, in the Three County Area. Linear Growth Scenario (from Geological Survey of Alabama, 1982; MMS, 1982)

AIR QUALITY

Maximum future ambient levels of total suspended particulates (TSP), sulfur dioxide (SO_2), and nitrogen dioxide (NO_2) will be attributable to rural baseline levels and emissions from towns and highways. Ambient pollutant levels in the vicinity of existing mines and future mines on private land should not significantly increase above existing levels and should have no significant impact on the air quality in the EIS area. Highest pollutant levels in the EIS area will be centered about major towns, such as Tuscaloosa. These concentrations should drop to rural baseline levels 5 to 10 miles from the towns.

Increases in pollutant levels around towns in the EIS area will indirectly result from population growth throughout the study years. Activities such as local vehicular traffic, residential and commercial space heating, building construction, and other municipal development, will be the primary sources of pollutant emissions. Increased vehicular traffic will result in pollutant concentration increases near highways. Railroads and haul trucks serving future development at coal mines in the EIS area also will produce increased pollutant emissions. Such emissions would be intermittent and the effects would be confined to narrow corridors along the railroad tracks and highways.

The primary impact to air resources would be a temporary, highly-localized increase in fugitive TSP concentration in the immediate vicinity of the mining and reclamation operations. This increase would be insignificant on a regional scale and involves no violations of existing standards. This impact may be mitigated by watering or other dust control techniques at the mine sites. Increases of other pollutants would be insignificant on a regional basis.

MINERAL RESOURCES

It is difficult to determine the amount of Federal coal that would be committed in the no action alternative. As stated above, there is one Federal lease currently under production which is currently yielding approximately 100,000 tons annually. Additionally, there is one emergency lease and 13 competitive sale leases that are currently not under production. Total leased in-place Federal tonnage for the above tracts is approximately 50 million tons.

There will be virtually no effect on other mineral resources due to Federal and leasing under this alternative. The underground mining in the Mary Lee seam will cause the loss of an undetermined amount of natural gas. The only effect on oil and gas will be the delay in exploration and development for the duration of mining. There will also be limited production of clay as a by-product of surface coal mining.

WATER RESOURCES

GROUND WATER

Disturbance to Aquifers - The unavoidable disturbance of certain aquifers will occur due to the mining of private coal reserves.

Aquifers removed by surface mining would be replaced by spoil aquifers or rubble zones that should have a recharge capacity and permeability equal to or greater than the original aquifers in the Pottsville Formation (see app. C).

An undetermined number of wells would be destroyed or otherwise impaired. Impaired wells include those with declines in water levels resulting where surface mines intersect water-bearing openings near wells, and where subsurface mines intersect water-bearing joints or faults that extend into overlying aquifers. Similarly, fractures resulting from subsidence that extend to the surface, or into overlying aquifers, can result in declines that impact wells. Declines resulting from surface mining can be short-term or long-term, and those resulting from subsurface mining are long-term. All declines in water levels are expected to be limited in extent.

Changes in Ground-Water Quality - Leaching of spoil materials and bedrock exposed in mines results in highly mineralized water available as recharge to underlying aquifers. Water in aquifers receiving recharge from mines becomes similar in quality to that of mine drainage which, near the mines, can have specific conductances and dissolved solids contents that approach or exceed 3,000 micromhos (umhos) and 2,000 milligrams per liter (mg/l), respectively (see table D-2, app. D). Water in wells impacted by recharge may be acidic or alkaline, depending on the chemistry of rocks with which it has been in contact. Typically, the recharge results in increases in hardness and in dissoved solids and sulfate contents. Significant increases in iron, aluminum, and manganese contents may occur. The degree of mineralization of water from many of the impacted wells would be expected to exceed that recommended for public supplies by National Secondary Drinking Water Regulations (U.S. Environmental Protection Agency, 1977). The impacts are limited in extent but may be long-term.

SURFACE WATER

Degradation of Water Quality - Degradation of water quality is by far the most serious problem resulting from surface mining because it extends beyond the boundaries of the mining area. Water in undisturbed streams in the EIS area is of good quality and that in streams already impacted by mining reflects increases in mineralization (see table D-1, app. D). In general, the degree of discharge and mineralization of water emanating from most surface mines at a given site will increase progressively and peak in 10 to 12 years before beginning its long-term return to baseline conditions. Mineralization of mine drainage at a given discharge is greatest at the mine and, in a receiving stream, declines with distance from the mine because of dilution. Mine drainage in the immediate vicinity of the mines, when the degree of mineralization has peaked, will be highly mineralized. Specific conductances and dissolved solids contents should approach or exceed 3,000 unhos and 2,000 mg/l, respectively. Estimated dissolved solids contents in drainage at the sites, in tons per year, are given in table 4-7. Mineralization of drainage will approach that in a mine when natural discharges approach zero and discharge into a stream is

restricted to that contributed by the mine. Projected impacts reflecting increases in mineralization in relation to discharge and time for Alternative One are located in table 4-3.

The pH and the iron and manganese contents in drainage emanating from mines are attenuated through chemical constituent concentrations and diversion channels (30 CFR 816.42). With this mitigation, impacts during mining should not adversely affect the streams as they are classified. Any impact to the major receiving streams should be minimal and restricted largely to the points of inflow.

The impacts to Lake Tuscaloosa on North River and Lakes Nicol and Harris on Yellow Creek, should be minimal with mitigations provided by state and Federal regulations. Water chemistry at selected sites is given in table D-1, appendix D, and information pertaining to the hydrology of Lake Tuscaloosa is given in appendix B.

The most significant potential impact resulting from the no action alternative, based on available information, can occur in subbasins during low or near zero flow after mining and the mitigation of pH and iron and manganese contents ceases. Mineralization of water in spoil aquifers will peak and unmitigated mine drainage will be supplied to streams as base flow. If the iron or the manganese contents are high, aquatic communities may be significantly impacted, especially in reaches near the mine. The impact will be far greater if the discharge is significantly acidic. Fortunately, many mines will generate pH values in the near neutral or alkaline range due to the presence of carbonate rocks.

Some base flow from waste rock accumulations resulting from subsurface mining may degrade the quality of water in nearby streams. The impact can be minimized by routing the water through a settling pond with treatment. The impact will be minimal, long-term, and local.

Impacts related to the discharge of mitigated subsurface mine and process effluent into receiving streams are unknown but probably will be minimal and long-term. It is assumed that they will be mitigated by the procedures of the Alabama Department of Environmental Management (ADEM) and the U.S. Environmental Protection Agency (EPA).

Other Impacts - Impacts on streamflow characteristics include increases in base flow from spoil aquifers and modification of flood flow. Impacts on flood flow will be local and insignificant. Impacts on base flow will be local and long-term and, after the accompanying impact on water quality dissipates, will be positive. See appendix C and appendix D (fig. D-2) for more discussion on changes in streamflow characteristics.

Impacts on surface-water resources from subsidence caused by underground mining are unknown but are not expected to be significant because of the anticipated depth of most mines and the presence of competent overlying strata.

Other impacts to surface-water resources resulting from Alternative One include the possible degradation of water quality resulting from sewage effluent, and increased water demand for mine and non-mine uses. These impacts should be local, short-term, and insignificant. The discharges into, and withdrawals from, streams will be permitted and monitored by EPA and ADEM.

VEGETATION

Under the no action alternative, a total of 123,000 acres of vegetation is projected to be removed by mining-related activities in the Subregion by the Year 1995. Primary short-term impacts include loss of all vegetative cover during construction and mining, and loss of plant productivity until lands are reclaimed. Examples of local reclamation have indicated that effective and permanent ground-cover vegetation should be reestablished on most sites within one year of mining. Several years may be required to determine the success of pine plantations, but successful establishement is expected based on the many reclamation examples for this type in both Alabama and the eastern United States. Any mining in riparian or bottomland hardwood types may result in a long-term loss of these communities as a demonstrated reclamation technology for these types is not presently available.

Depending upon the reclamation preferences of the landowner and the regetation requirements stipulated by the State Regulatory Authority, postmining vegetation types may differ from the premining condition. Past reclamation examples have shown a trend toward the postmining creation of pine monocultures or pasture, which are often perceived as having a "higher" land use value than the premining mixed pine-hardwood or hardwood types. Implementation of the No Action Alternative should have no effect on threatened or endangered species.

WILDLIFE

Immediate impacts to wildlife from surface disturbances related to mining include loss of less mobile species and displacement of large mobile animal species into adjacent habitats. Reliable statistics are not available on existing or optimum population densities and carrying capacities for any wildlife in the Subregion, so it is unknown how many animals of any species will be lost or displaced during mining. Estimates of deer and turkey populations indicate that approximately 3,100 deer and 1,200 turkeys would be temporarily displaced, because of mining activities in the Subregion by the year 1995, if regional projections of future mining activities are accurate. In terms of wildlife habitat, a total of 123,000 acres, or approximately 7 percent, of the wildlife habitat in the 3-county area will be disturbed by mining by the year 1995. Within a year of the initial disturbance, an effective and self-sustaining ground cover, which will help to control erosion and sedimentation, should be in place. Postmining establishment of forest habitats will take much longer (e.g., 10 to 40+ years), depending on the forest type and the evaluation criteria used for measuring success. The wildife portion of Table 2-1 presents the acreage, type and significance of wildlife habitat loss from each alternative. On a regional basis,

these impacts are not believed to be significant, as much of the habitat to be disturbed will consist primarily of mixed pine-hardwood and pine forest, which are common in the region. Locally, some "multihabitat" species such as the white-tailed deer and mourning dove may be benefited by the postmining creation of additional "edge" and food sources, whereas those species that have very narrow habitat requirements (e.g., flattened musk turtle, gray squirrel) would be negatively affected upon disturbance their habitat (see chapter 4 for a more detailed discussion of specific impacts). Implementation of the No Action Alternative should have no effect on threatened or endangered species.

LAND USE

The major land uses in the area are forest and agriculture. Surface mining is also an important land use in the EIS region. Due to the nature of the coal mining industry in this area, it is not possible to accurately project where and to what degree land use will be affected without new Federal coal leasing. By the years 1985, 1990, and 1995, a cumulative total of 78,000, 94,000, and 123,000 acres, respectively, will be disturbed by coal mining without any new Federal coal leasing. However, reclamation will be accomplished in conjunction with mining operations. Approximately 10,000 acres would be out of production at any given time. Local reclamation results indicate that disturbed lands may be reclaimed to pasture or pine forest, without extraordinary efforts or expense.

SOILS

The disturbance under this alternative is associated with the previously leased tracts. This disturbed area equals approximately 5,893 acres of which about 1,875 acres are good soils, 2,653 acres are fair, and 1,365 acres are poor soils. (The criteria for evaluating soils are contained in table 3-7.)

In surface mining, the natural soil horizon would be destroyed and soil texture, consistency, structure, plant nutrient levels, soil reaction, and moisture regimes would be changed. The overburden surface would be more compact and more erosive because of steeper slopes and removal of the present root mat. Reclamation of the disturbed areas will be phased concurrently with mining in accordance with state and Federal regulations.

CULTURAL RESOURCES

Under Alternative One, all of the known and unknown cultural resources in the EIS study region could be subject to adverse impacts (e.g., removal or destruction), through activites unrelated to leasing of Federal coal (i.e., logging, agriculture, mining of privately-owned coal, road building, construction and natural erosion). At the present time, there are 114 known cultural resource properties located within the defined study area. Most of these resources were recorded during the 1978 sample inventory conducted for BLM by the Office of Archaeological Research at the University of Alabama. Based on this 1978 inventory it

was concluded that historic resources will normally be found on upland ridges between elevations of 151 to 250 meters above mean sea level (now referred to as NGVD of 1929). Prehistoric resources tend to cluster in an area 201 to 400 meters from the nearest water source, primarily first order streams; prehistoric resources are also most commonly found on level areas of ridge knolls, fingers, and spurs.

The existing data base indicates that prehistoric and historic resources in the EIS region (including resources recorded on previously-leased BLM tracts) are small and relatively insignificant properties. There are no National Register of Historic Places (NRHP) listed or nominated properties located over FMO which will be impacted from mining activities. Most of the recorded properties in the area appear to have low potential for NRHP eligibility. Mining operations and support facilities on the previously leased BLM tracts could produce ground disturbance which could impact a total of 26 known cultural resource properties, as well as any undiscovered resources which may exist. As mitigating measures, stipulations on each coal lease require inventory of affected areas of the tracts, prior to mining.

RECREATION

Urban recreation will not significantly be affected by any population increase; it is not expected to reach .5 percent of the present population. Other recreational activities, such as hunting and fishing, should not be affected as a result of this alternative.

VISUAL RESOURCES

Alternative One would have an insignificant impact on visual resources. There are no significant or outstanding visual resources located on any of the previously leased tracts. Because of the nature of Federal coal ownership in the 3-county area, no evaluation of visual resources on adjacent private areas was made.

SOCIOECONOMICS

Under the no action alternative, a baseline population growth of 6 to 7 percent is expected to occur between 1980 and 1995.

The growth rates of the communities in the 4-county area (including Jefferson County) are projected as follows: Berry, 22 percent; Fayette, 15 percent; Birmingham, 4 percent; Tuscaloosa, 12 percent; Northport, 38 percent; Carbon Hill, 17 percent; and Jasper, 7 percent. This anticipated level of growth should create no severe community socio-structural breakdown.

Mining is expected to continue to provide an important contribution to the area's economic base. Mining employment in 1995 will increase by 109 percent over the 1980 figure, with increases by county as follows: Fayette, 32 percent; Jefferson, 113 percent; Tuscaloosa, 113 percent; and Walker, 113 percent. By comparison, the total projected employment increase for the area for the same period will be 69 percent.

By 1995, it is likely that all of the communities in the area will have increased demands for housing and community facilities, such as water and sewer services, solid waste services, schools, and police and fire, as a result of growth which will occur regardless of Federal actions.

Under the projected level of operations for previously leased Federal coal tracts, approximately $1.1 million in severance tax, and $3.7 million in Federal royalty (1/2 of which is returned to the state) will be collected. Much of that revenue will be returned to the counties where the coal is mined to help pay for some of the above mentioned facilities' impacts.

TRANSPORTATION

The road system appears to have adequate capacity until at least 1995. The Average Daily Traffic (ADT) and the volume to capacity (v/c) ratios are projected to increase slightly. The v/c ratios are projected to be below 50 percent by 1995 (DEIS, 1980).

The Southern Railway line from Pride, Alabama, to Birmingham, Alabama, has one of the highest traffic densities of any line in Alabama. However, the line appears to be adequate for present needs and limited increases in traffic (A. L. Stephens, personal communication, 1983).

Barge figures for 1980 indicated that 10 million tons of coal passed through Oliver Lock on its way downstream (Glenda Smith, personal communication, 1983).

This alternative would generate approximately 6.40 million tons of coal per year. Using the state figure (table 2-2) of 21 percent, an annual increase of about 1.35 million tons can be predicted. This should be a close approximation of the annual tonnage increase on the Black Warrior River system as a result of this alternative.

Estimate of tow delays resulting from projected increases in waterborne commerce indicates a lock capacity in the range of 25 to 30 million tons, and this should not occur before the year 2000 (Army Corps of Engineers, 1981).

Table 2-2. Estimation of Coal Shipments by Transportation Mode

Transportation Mode	1981 percent	Annual Production in Million Tons Alt. I (Baseline)	Alt. II	Alt. III	Alt. IV
Rail	41	2.624	2.829	3.472	4.334
Truck	33	2.112	2.277	2.795	3.488
Barge	21	1.344	1.449	1.779	2.220
Other	5	.320	.345	.424	.528
Totals	100	6.40	6.90	8.41	10.57

Source: Percent figures were taken from table 28. Alabama Coal Data for 1981.

NET ENERGY ANALYSIS

Evaluation of the energy efficiency of mining under this alternative has shown a production surplus. This surplus is expressed as the ratio of energy produced by mining to the energy consumed by mining in British thermal units (Btus). In the leased underground tracts, this surplus ranges from 220:1 to 270:1. In the leased surface tracts, this surplus ranges from 25:1 to 48:1. For details on assumptions and methodology, please see Appendix E.

ALTERNATIVE TWO

This alternative includes 7 tracts (3 underground and 4 surface minable) ranked "high" by the Regional Coal Team (RCT) (see fig. 2-5). Federal recoverable coal resources would total about 109 million tons, which, with the included privately owned coal, would result in an annual production of 6.9 million tons. The Revised Boxes Creek By-Pass tract is a by-pass to an existing mine. Jock Creek, Pleasant Grove Church, and Panther Branch may become by-passes within the next five years.

AIR QUALITY

This alternative will produce an insignificant impact on the air quality resource in the EIS region. A slight increase in fugitive dust can be expected at the mines, vehicle trafficways, and coal processing facilities. These would be localized and would not violate the annual TSP standard. Levels of other pollutants would be minimal.

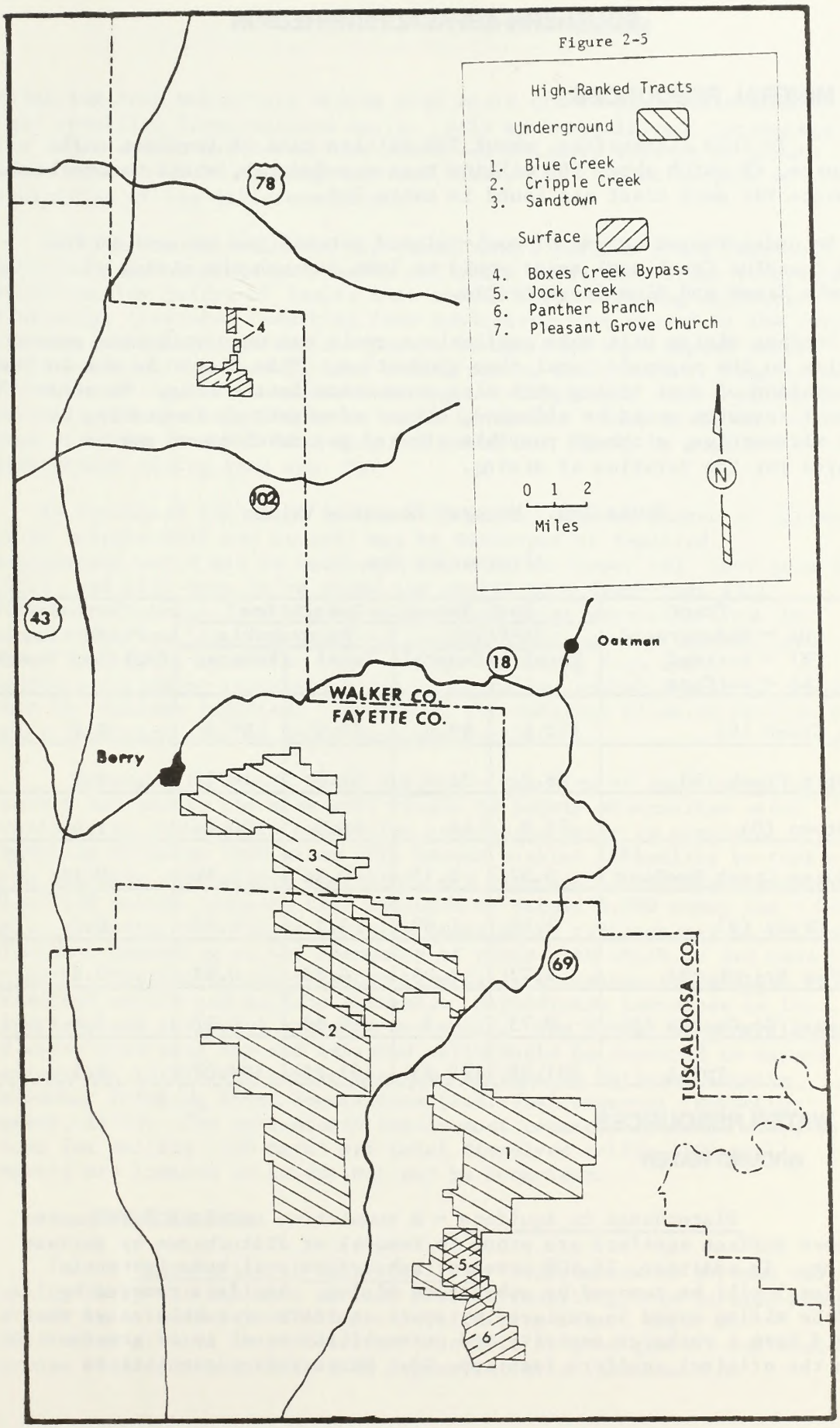


Figure 2-5
High-Ranked Tracts
Underground
1. Blue Creek
2. Cripple Creek
3. Sandtown
Surface
4. Boxes Creek Bypass
5. Jock Creek
6. Panther Branch
7. Pleasant Grove Church
0 1 2
Miles
N
78
102
43
18
69
Oakman
WALKER CO.
FAYETTE CO.
Berry
TUSCALOOSA CO.
1
2
3
4
5
6
7

MINERAL RESOURCES

In this alternative, about 302 million tons of in-place coal resource, of which about 180 million tons are Federal, would be involved. Tonnages for each tract are found in table 2-3.

An undetermined amount of coal-related natural gas present in the Mary Lee-Blue Creek coal seams would be lost through the mining of Cripple Creek and Blue Creek tracts.

Surface mining will make available a small but unquantifiable amount of clay to the region's total clay production. This factor is due to the association of coal mining with clay production in the area. No other mineral resource would be affected, either adversely or favorably, by this alternative, although possible oil and gas development may be delayed for the duration of mining.

Table 2-3. Mineral Resource Values

Alternative Two

Tract (U) - Underground (R) - Revised (S) - Surface	Coal Resource Quantities				Annual Production (Million Tons)
	In-Place		Recoverable		
	Total	Federal	Total	Federal	
Blue Creek (U)	132.6	99.6	79.6	59.8	2.2
Cripple Creek (U)	88.2	31.4	61.7	16.1	1.8
Sandtown (U)	72.9	46	48.5	30.6	1.4
(S)(R)Boxes Creek By-Pass	0.37	0.37	0.34	0.34	0.11
Jock Creek (S)	2.45	1.09	2.2	0.98	0.5
Panther Branch (S)	4.73	1.09	4.25	0.98	0.5
Pleasant Gr.Church (S)	0.73	0.3	0.66	0.27	0.4
TOTAL	301.98	179.85	197.25	109.07	6.9

WATER RESOURCES

GROUND WATER

Disturbance to Aquifers - A cumulative total of 7,685 acres of near surface aquifers are prone to removal or disturbance by surface mining. In addition, 28,108 acres of subsurface coal beds (potential aquifers) will be removed by subsurface mining. Aquifers removed by surface mining would be replaced by spoil aquifers or rubble zones that should have a recharge capacity and permeability equal to or greater than the original aquifers (see app. C). Waste rock accumulations

resulting from subsurface mining also would create an aquifer similar to that resulting from replaced spoil. Only an insignificant percentage of the major stream basins will be disturbed and most impacts to ground water systems would be long-term but local, and limited largely to the vicinities of the different mines.

Declines in water levels may result where surface mines intersect water-bearing openings near wells and where subsurface mines intersect water-bearing joints or faults that extend into overlying aquifers. Similarly, fractures resulting from subsidence that extend to the surface or into overlying aquifers can result in declines that impact wells. Declines resulting from surface mining can be short-term or long-term. Those resulting from subsurface mining are long-term. All declines in water levels are expected to be local in extent. Most wells in the EIS area are less than 250 feet deep and would not likely be impacted by underground mining (see app. D).

An estimated 230 wells (table 4-1) and an unknown number of springs (most nonperennial and unused) may be destroyed or impaired. Replacement wells may be completed but will be deeper and have greater lifts, and will have to be cased and sealed to a depth that will eliminate recharge from highly mineralized water emanating from the mines. Springs impacted would be removed or affected by mineralized water from spoil aquifers. New springs emanating from spoil aquifers following reclamation and resaturation probably will be larger than the springs impacted. Impacts to the quantity of water available prior to mining will be short-term and local.

Changes in Ground Water Quality - Leaching of spoil materials and bedrock exposed in the mine will result in highly mineralized water available as recharge to underlying aquifers. Water in aquifers receiving recharge from mines will become similar in quality to that of mine drainage which, near the mines, can have specific conductances and dissolved solids contents that approach or exceed 3,000 unhos and 2,000 mg/l, respectively. Water in wells impacted by recharge may be acidic or alkaline, depending on the chemistry of rocks with which it has been in contact. Typically, the recharge results in increases in hardness and in dissolved solids and sulfate contents. Significant increases in iron, aluminum, and manganese contents may occur. The degree of mineralization of water from many for the impacted wells would be expected to exceed contaminant levels for public supplies defined in National Interim Secondary Drinking Water Regulations (U.S. Environmental Protection Agency, 1977). The contaminant levels most commonly exceeded would be those for sulfate (250 mg/l) and total dissolved solids (500 mg/l). The impacts are limited in extent but may be long-term.

SURFACE WATER

Degradation of Water Quality - Degradation of surface water quality is by far the most serious problem resulting from surface mining because it extends beyond boundaries of mining area. Water in undisturbed streams in the various tracts is of good quality and that in streams already impacted to some degree reflects increases in

mineralization. Water quality information, based on available data for unimpacted and impacted streams draining the subject tracts is given in appendix D, table D-1. In general, the degree of mineralization of water emanating from most surface mines at a given site and discharge will increase progressively and peak in 10 to 12 years before beginning its long-termed return to baseline conditions. Projections of impacts at sites on streams draining tracts in this alternative are given for different time frames and discharges in table 4-4. Methodology utilized to make projections is described in appendix A.

Mineralization of mine drainage at a given discharge is greatest at the mine, and, in a receiving stream, declines with distance from the mine because of dilution. Mine drainage in the immediate vicinity of the mines, when the degree of mineralization has peaked, will be highly mineralized. Specific conductances and dissolved solids content should approach or exceed 3,000 umhos and 2,000 mg/1, respectively. Projected impacts reflecting increases in the mineralization of water with time and at different discharges (table 4-4) include impacts from other mining in the subbasins as it existed in 1982. Estimated dissoved solids content in drainage at the sites, in tons per year, are given in table 4-7. Mineralization of streamflow will approach that in a mine when natural discharges approach zero and the remaining discharge is restricted to that contributed by the mine.

The pH and the iron and manganese contents in any drainage that may result from mining are to be mitigated according to 30 CFR 816.42. With this mitigation, impacts during mining should not adversely affect the streams as they are classified. Any impact to the major receiving streams would be minimal and restricted to the points of inflow.

The most significant potential impact resulting from the surface mining of Federal coal, based on available information, can occur in subbasins during low or near zero flow after mining and the mitigation of pH and the iron and manganese contents ceases. Mineralization of water in spoil aquifers will peak and unmitigated mine drainage will be supplied to streams as base flow. If the iron or the manganese contents are high, aquatic communities might be significantly impacted, especially in reaches near the mine. The impact will be far greater if the discharge is significantly acidic. Fortunately, many mines will generate pHs in the near neutral or alkaline range (see table D-1, app. D).

Under Alternative Two, Pleasant Grove Tract, with an area of 260 acres (0.41 sq. mi.), is the only surface tract which will drain into North River, which forms Lake Tuscaloosa. Two tracts, Sandtown, with an area of 19.9 square miles, and Cripple Creek, with an area of 23.2 square miles, also drain into North River.

The effects of underground mining on water quality in the EIS area are indicated by samples collected in Cedar Creek and North River below an existing mine near Berry. The water had a total alkalinity of 559.3 and was slightly alkaline with a pH of 8.63. The average conductance value was 1,923.3 micromhos, with concentrations of chloride (336.1 mg/1), sodium (165.5 mg/1), and potassium (6.97 mg/1) (Shotts, Sterett,

Simpson, 1979). Probably no part of the proposed underground mines will be under less than 400 feet of overburden. When abandoned, the mines probably will completely fill with water because the water table lies well above the mined seams. There is a possibility that the top of shafts and slope openings may overflow. If the mines are effectively sealed and filled with water, little or no oxygen should enter the mines and mineralization (oxidation) should be attenuated.

Other Impacts - Impacts on streamflow characteristics include increases in base flow from spoil aquifers and modification of flood flow. Impacts on flood flow will be short-term, local, and insignificant. Impacts on base flow will be local and long-term and, after the accompanying impact on water quality dissipates, will be positive (see app. C).

Impacts on water resources from subsidence caused by underground mining are not expected to be significant because: 1) the depth of the mines (Blue Creek - 400-1,100 feet), (Cripple Creek - 600-1,100), (Sandtown - 400-850), 2) the presence of competent (sandstone) overlying strata 3) coalbed thickness (3 to 5 feet per seam with 2 seams mined in some tracts), and 4) mining methods (room and pillar with pillar robbing and longwall).

After mining and support removal in rooms, rock falls should occur until a very strong, competent sandstone is reached, or the broken rock fills the mined void and provides support. Mines at depths greater than 400 feet will generally fill the mined void before the effects reach the surface. If complete pillar removal or longwall mining is used, it is likely that some subsidence will occur over the entire mined area. The subsidence could impact any wells in the mined area by draining the supplying aquifer or by damaging the casing in the well. Surface water could be diverted to the area of subsidence. Surface water and/or ground water supplies may be decreased if fractures from the subsurface mines extend into overlying streams and/or aquifers.

Impacts resulting from erosion and sedimentation are expected to be local and short-term. Mitigating measures, if successful, probably will restrict sediment yields to premining levels. Based on the maximum average suspended solids concentration allowed by law (35 mg/l) and a continuous near average discharge of 1.5 cfs/sq. mi., the suspended sediment load would be equivalent to about 51 tons/sq. mi./yr. This would be similar to or less than that emanating from many unmined basins.

Other impacts to surface water resources resulting from the mining of Federal coal, both onsite and offsite, should be minimal or insignificant, short-term and localized. This includes possible degradation of water quality resulting from sewage effluent and increased water use by mines which, in places, will probably require some storage impoundments.

VEGETATION

Impacts to vegetation from implementing Federal leasing would cumulatively total 125,805 acres by the year 1995 as a result of coal

mining. Impacts to approximately 7,685 acres, or 6.1 percent of this acreage, would be attributable to the proposed action. Implementation of this alternative should have no effect on threatened or endangered species.

WILDLIFE

Impacts to wildlife resulting from implementation of this alternative would be the same as for Alternative One, except an additional 7,685 acres of wildlife habitat would be disturbed. Rough estimates indicate that the Federal action would displace or cause the temporary loss of approximately 195 deer and 85 turkeys. Implementation of this alternative should have little or no effect on threatened or endangered species.

LAND USE

Under this alternative, present land use, probably forest, would be pre-empted on approximately 388 acres in 1985, 2,614 cumulative acres by 1990, and 2,954 cumulative acres by 1995. Suitable replacement forest lands are available throughout the EIS region. The disturbance of 2,954 cumulative acres is not significant when considered on a regional land use basis. Also, because of the contemporaneous reclamation requirement, only a portion of this total would be used for mining at any one time. Damage to surface improvements through subsidence cannot be accurately predicted, but is expected to be minimal in the EIS region.

All surface over Federal coal deposits within the subject surface tracts is owned by individuals or companies. To date, no surface owner of lands over Federal coal deposits within the subject surface tracts has submitted a Statement of Refusal to Consent to surface mining of their property. Surface owner consent is not required for underground mining. Federal law will be complied with to protect surface owner rights.

SOILS

The surface mines in this alternative would disturb approximately 1,754 acres of soil by the year 1995. These acreages are composed of about one acre of good soils, 1,209 acres of fair soils, and 544 acres of poor soils. The acreage figures for surface facilities associated with underground tracts cannot be precisely addressed until after the mine plan has been submitted. Only then can the location and impacts of related surface effects be identified.

In surface mining, the natural soil horizon would be disturbed and soil texture, consistency, structure, plant nutrient levels, soil reaction, and moisture regimes would be changed. This could occur despite OSM regulations protecting topsoil (30 CFR 816.22(a), because topsoil is very shallow in the areas to be mined. The overburden surface would be more compact and more prone to erosion because of steeper slopes and removal of the present root mat. Reclamation of the disturbed areas will be phased concurrently with mining in accordance with state and Federal regulations.

CULTURAL RESOURCES

A total of 29 known cultural resource properties could be affected by mining of the 7 proposed tracts under this alternative. The breakdown of these resources by basic category is as follows: 8 prehistoric; 15 historic; 4 multicomponent; and 2 standing folk houses. (Table 3-6 gives a brief description and the cultural affiliation of each resource recorded.) Six cultural resource properties are located on the surface tracts with only two of these on minable portions of these tracts. Twenty-four resources are located on the overall surface areas delineated for the underground tracts. Because many of the proposed tracts overlap in respect to surface delineation, there is some duplication of occurrence reflected in the figures above. (See table 3-7 for tract-by-tract occurrence of known cultural resource properties.)

With the exception of Revised Boxes Creek By-pass, which has been completely inventoried for cultural resources, the remainder of the tracts under this alternative range from having had 33 percent inventory conducted, to no inventory; the majority of tracts have had less than ten percent inventory conducted within the surface delineated areas (see table 4-11).

The existing data base indicates that prehistoric and historic resources in the proposed lease areas are small and relatively insignificant properties. There are no NRHP listed or nominated properties located on any of the proposed tracts. None of the recorded resources have yet been evaluated for NRHP eligibility through procedures in 36 CFR parts 60.6 and 63.

Identified cultural resource properties will be treated in accordance with procedures contained in the "Programmatic Memorandum of Agreement (PMOA) among the Department of the Interior, Bureau of Land Management, Office of Surface Mining Reclamation and Enforcement, and United States Geological Survey, and the Advisory Council of Historic Preservation regarding the Federal coal management program." This PMOA became effective on May 20, 1980 and was amended in March of 1983 (ACHP, May 1980) (ACHP, March 1983). In accordance with the PMOA as presently worded, intensive field inventories (BLM Class III) are required prior to mine plan approval. Such inventories will be conducted for all areas subject to ground disturbance which have not previously been inventoried at such a level of intensity.

RECREATION

The tracts associated with this alternative have no real recreational value except for casual use by the surface owners for hunting. The impact to recreation would be low to nonexistent. There could, in fact, be positive impacts for hunting, as the reclamation would create an "edge" effect on the vegetation (see Wildlife sections).

VISUAL RESOURCES

Alternative Two should have an insignificant impact on visual resources. There are no significant or outstanding visual resources located on any of the tracts considered for this alternative.

SOCIOECONOMICS

Considerable economic impacts would occur as a result of the Federal leasing program under Alternative Two. Mining employment and income would increase by 9 percent over the no action alternative, with an employment increase of 2,365 and an income increase of $68.9 million.

Total employment and income increases would be 1 percent and .58 percent, respectively, with numerical increases of 3,430 persons and $61.6 million.

Public revenue from this alternative would vary. There would be a relatively insignificant additional impact on severance tax of $.82 million. The additional impact on royalty, however, would be highly significant at $5.4 million over the figure for the no action alternative.

Population increases, and the resultant impacts on housing and community facilities, would be insignificant, with only 1,476 additional persons in-migrating into the entire impacted area. This is a .002 percent increase over the no action growth rate.

TRANSPORTATION

The ADT and v/c ratios for highway traffic will have a very small increase over the projected levels for the no action alternative (Alternative One). Enough excess capacity exists to accommodate additional traffic flow (State of Alabama, Highway Department data, 1983). The railway systems could experience an increase between 0 and 45 percent in coal tonnages hauled. This alternative would generate approximately 6.90 million tons of coal per year. Using the state figure of 21 percent (table 2-2), an annual increase in barge haulage of about 1.45 million tons can be predicted. This should be a close approximation of the annual tonnage increase on the Black Warrior River system as a result of this alternative (see Alternative One, No Action).

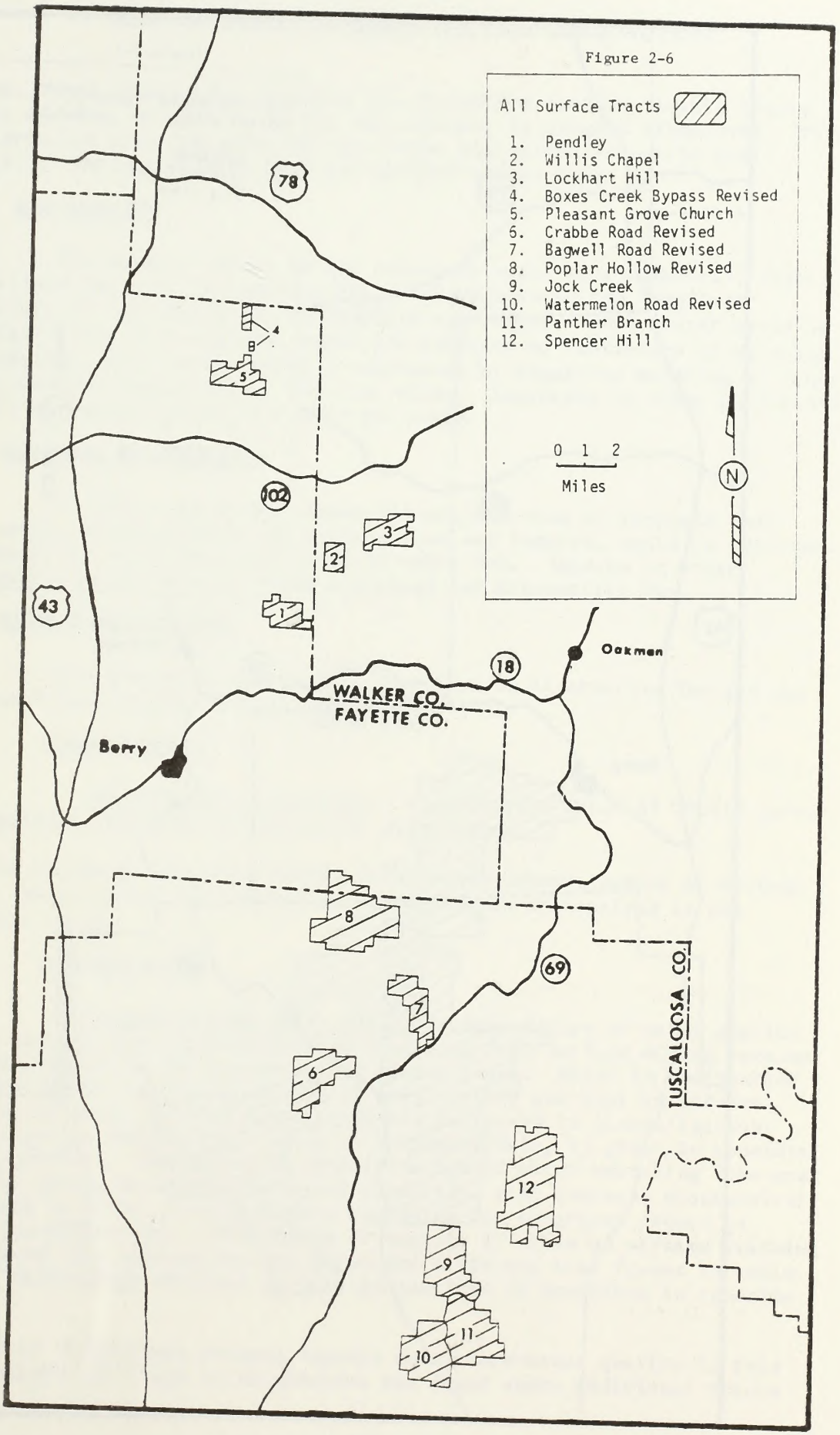
NET ENERGY ANALYSIS

Evaluation of the energy efficiency of mining under this alternative has shown a production surplus. This surplus is expressed as the ratio of energy produced by mining to the energy consumed by mining in Btus. In the underground tracts, this surplus ranges from 220:1 to 245:1. In the surface tracts, this surplus ranges from 13:1 to 22:1. For details on assumptions and methodology, see appendix E.

ALTERNATIVE THREE (PREFERRED ALTERNATIVE)

This alternative includes 15 tracts, 3 underground and 12 surface minable. (See figs. 2-6 and 2-7.) Federal recoverable coal resources would total about 113 million tons, which, with the included privately owned coal, would result in an annual production of about 8.5 million

Figure 2-6


All Surface Tracts
1. Pendley
2. Willis Chapel
3. Lockhart Hill
4. Boxes Creek Bypass Revised
5. Pleasant Grove Church
6. Crabbe Road Revised
7. Bagwell Road Revised
8. Poplar Hollow Revised
9. Jock Creek
10. Watermelon Road Revised
11. Panther Branch
12. Spencer Hill
0 1 2
Miles
N
78
102
43
18
69
Oakman
Berry
WALKER CO.
FAYETTE CO.
TUSCALOOSA CO.

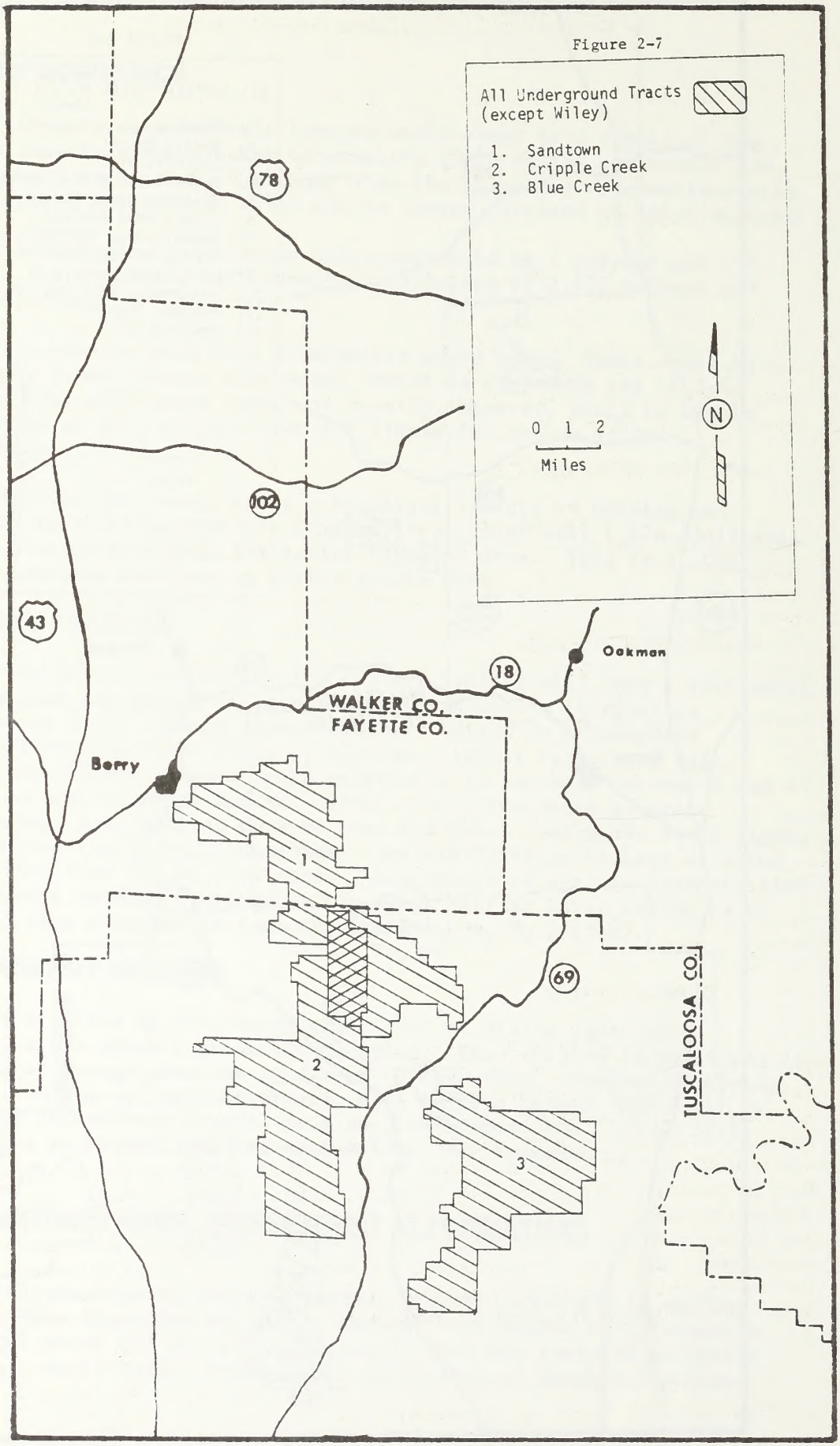


Figure 2-7
All Underground Tracts
(except Wiley)
1. Sandtown
2. Cripple Creek
3. Blue Creek
0 1 2
Miles
N
78
102
43
18
69
Oakman
Berry
WALKER CO.
FAYETTE CO.
TUSCALOOSA CO.
1
2
3

tons. This alternative includes all delineated surface minable tracts that are now, or will be in the near future, in by-pass situations. This alternative also includes the two tracts set aside for public body leasing--Revised Bagwell Road and Revised Crabbe Road.

AIR QUALITY

The primary impact to air resources would be a temporary, highly localized increase in fugitive TSP concentration in the immediate vicinity of the mining and reclamation operations. This impact would be insignificant on a regional scale and involves no violations of existing standards. This impact could be mitigated by requiring watering or other dust-control techniques at the mine sites. Increases of other pollutants would be insignificant on a regional basis.

MINERAL RESOURCES

In this alternative, about 314 million tons of in-place coal resource, of which about 184 million tons are Federal, would be involved. Tonnages for each tract are found in table 2-4. Impacts on other minerals are the same as those discussed for Alternative Two.

WATER RESOURCES

Data presented and impacts described in Alternative Two are not repeated here as they remain unchanged.

GROUND WATER

Disturbance to Aquifers - A cumulative total of 29,418 acres of aquifers are prone to removal or disturbance.

An estimated 338 wells (table 4-1) and an unknown number of springs (most nonperennial and unused) may be destroyed or impaired in the various tracts.

SURFACE WATER

Degradation of Water Quality - Degradation of water quality is by far the most serious problem resulting from surface mining because it extends beyond the boundaries of mining areas. Water in undisturbed streams in the various tracts is of good quality and that in streams already affected to some degree reflects increases in mineralization. Water quality information, based on available data, is given in appendix D. In general, the degree of mineralization of water emanating from most surface mines, at a given site and discharge, will increase progressively and peak in 10 to 12 years before beginning its long-term return to baseline conditions. Projections of impacts at sites on streams draining tracts in this alternative are given for different time frames in table 4-5. Methodology utilized to make projections is described in appendix A.

Major differences between impacts on surface-water quality in this alternative and those in alternative two occur where additional tracts

are located in common subbasins. Sites receiving additional mine drainage resulting from the inclusion of new tracts under this alternative are 1, 2, 3, 22, 23, 24, 25, and 33. Projected water quality impacts for these sites (table 4-5) exceed those for the same sites under Alternative Two (table 4-4). The estimated increase in dissolved solids, in tons per year, is given in table 4-7.

VEGETATION

Impacts to vegetation from implementing Alternative Three would be the disturbance of approximately 129,440 acres in the Subregion by the Year 1995. Of this total, impacts to approximately 9,160 acres, or 7.1 percent, would be attributable to the Federal action. Implementation of Alternative Three should have no effect on threatened or endangered species.

WILDLIFE

Impacts to wildlife habitat resulting from adoption of this alternative are the same as with the no action alternative, with an additional disturbance of 9,160 acres of habitat, and loss or displacement of approximately 225 deer and 85 turkeys. Implementation of Alternative Three should have no effect on threatened or endangered species.

LAND USE

Under this alternative, present land use would be pre-empted on approximately 918 acres in 1985, 4,916 cumulative acres by 1990, and 6,384 cumulative acres by 1995. Suitable replacement lands are available throughout the EIS Region. The disturbance of 6,384 cumulative acres is not significant when considered on a regional land use basis. Also, because of the contemporaneous reclamation requirement, only a portion of this total would be used for mining at any one time.

All surface over Federal coal deposits within the subject surface tracts is owned by individuals or companies. Section 714 of SMCRA defines surface owners and the protections offered to qualified surface owners. To date, two surface owners of land over Federal coal deposits included in tracts in this alternative, have submitted Statements of Refusal to Consent to surface mining of their land. These surface owners are considered nonqualified, as defined in SMCRA. The total area for which surface owners have refused consent is 200 acres. Surface owner consent is not required for underground mining. Federal law will be complied with to protect surface owner rights.

Post mining land use cannot be determined until approval of mine plans by the state and Federal regulatory bodies. However, with variance to the original contour requirement productivity of the land in steep slope areas, may be enhanced. The land must be reclaimed as prescribed by Federal and state laws.

ALTERNATIVES INCLUDING THE PROPOSED ACTION

SOILS

The surface mines in this alternative would disturb approximately 5,184 acres of soil by the year 1995. These acreages are composed of about: 263 acres of good soils, 2,131 acres of fair soils, and 2,790 acres of poor soils. The acreage figures for surface facilities associated with underground tracts cannot be precisely addressed until after the mine plan has been submitted. Only then can the locations and impacts of related surface effects be identified. Other impacts on soil charcteristics are discussed under Alternative Two.

CULTURAL RESOURCES

Essentially, the impacts to the known cultural resource properties under Alternative Three are the same as discussed under Alternative Four. All five recorded properties for the Revised Wiley tract also overlie the Cripple Creek tract delineation, and therefore, are duplicated.

RECREATION

The majority of the 15 tracts associated with this alternative have no real recreational value except for casual use by the surface owners for hunting.

Four of the surface tracts have acreages that overlap with those managed by the Wolf Creek Wildlife Management Area and the Piney Woods Wildlife Management Area. The recreation and wildlife sections of chapter 3 describe the locations and functions of these management areas.

VISUAL RESOURCES

Alternative Three should have an insignificant impact on visual resources. There are no significant or outstanding visual resources located on any of the tracts considered in this alternative.

SOCIOECONOMICS

The preferred alternative (Alternative Three) would cause a relatively small additional economic impact over Alternative Two. Mining income would increase to $71.3 million (4 percent over the previous alternative) while secondary income would increase to $63.1 million (2 percent over previous alternative). There would be respective increases in mining and secondary employed personnel of 2,392 and 3,521. Severance tax would increase to $2.1 million and Federal royalties to $9.6 million. There would be no increases in population and, therefore, no resultant impacts on housing and community infrastructure.

TRANSPORTATION

The ADT and v/c ratios will not increase by a significant amount over levels projected for the no action alternative. Enough excess capacity apparently exists so that the service level of the roads will

not decline. An increase in rail haulage of between 0 and 42 percent in coal tonnages is expected. This alternative would generate approximately 8.47 million tons of coal per year. Using the state figure of 21 percent (table 2-4), an annual increase in barge haulage of about 1.78 million tons can be predicted. This should be a close approximation of the annual tonnage increase on the Black Warrior River system as a result of this alternative (See Alternative One, No Action).

NET ENERGY ANALYSIS

Evaluation of the energy efficiency of mining under this alternative has shown a production surplus. This surplus is expressed as the ratio of energy produced by mining to the energy consumed by mining in Btus. In the underground tracts, this surplus ranges from 220:1 to 245:1. In the surface tracts, this surplus ranges from 13:1 to 25:1. For details on assumptions and methodology, see appendix E.

ALTERNATIVE FOUR

This alternative includes 16 tracts, 4 underground and 12 surface minable. (See figs. 2-8 and 2-9.) Federal recoverable coal resources would total about 128.5 million tons, which, with the included privately owned coal, would result in an annual production of about 10.6 million tons. This alternative includes all delineated surface-minable tracts that are now, or will be in the near future, in by-pass situations. This alternative also includes the two tracts set aside for public body leasing--Revised Bagwell Road and Revised Crabbe Road.

AIR QUALITY

The impacts are essentially the same as those discussed under Alternative Three. A slight increase in fugitive dust can be expected at mine portals, vehicle trafficways, and coal processing facilities. These would be very localized and would not violate the annual TSP (total suspended particulates) standard.

MINERAL RESOURCES

In this alternative, about 420 million tons of in-place coal resources, of which about 211 million tons are Federal, would be involved. Tonnages for each tract are found in table 2-5. The impacts for other minerals are the same as those discussed under Alternative Two.

Figure 2-8

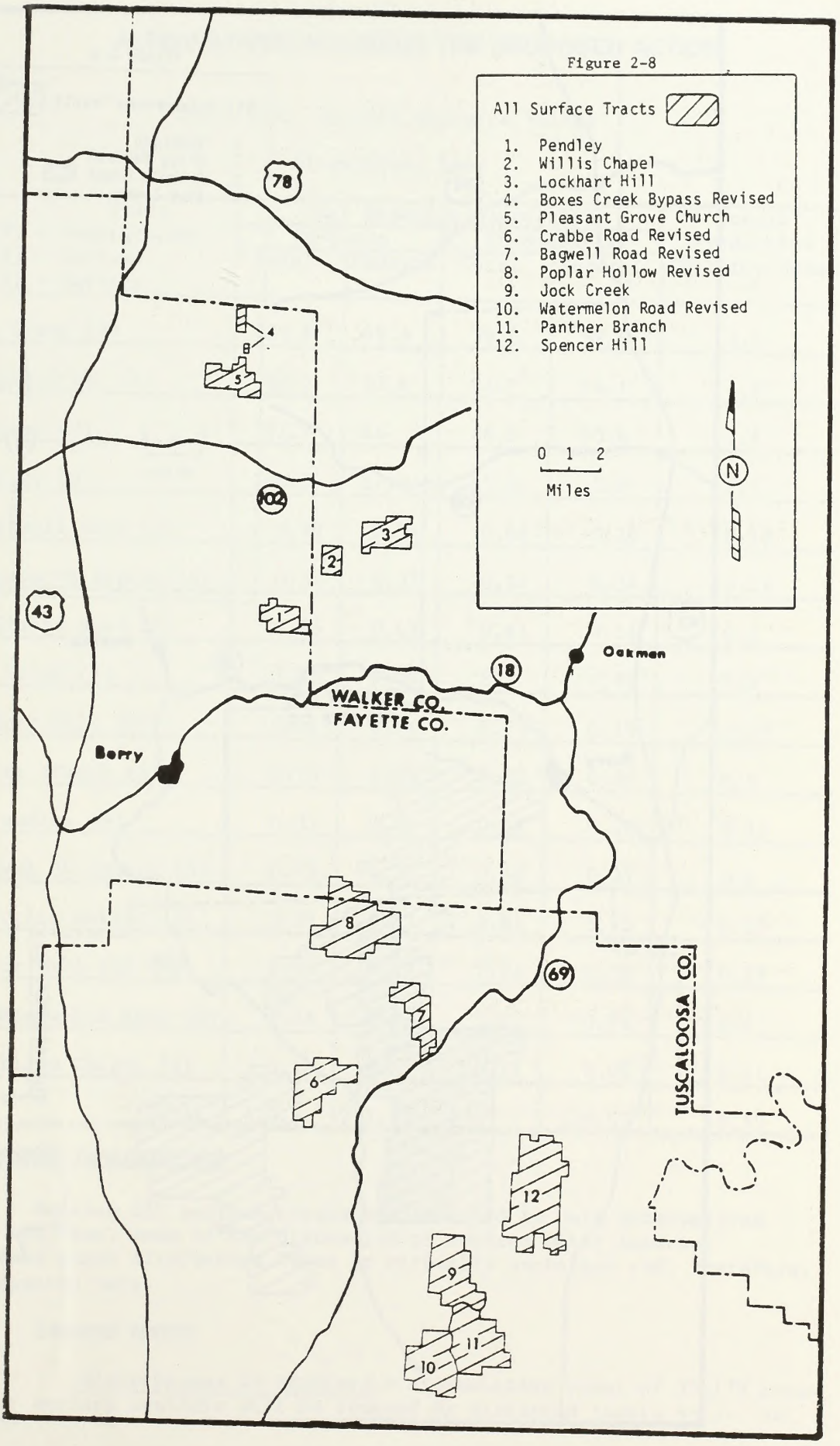

All Surface Tracts
1. Pendley
2. Willis Chapel
3. Lockhart Hill
4. Boxes Creek Bypass Revised
5. Pleasant Grove Church
6. Crabbe Road Revised
7. Bagwell Road Revised
8. Poplar Hollow Revised
9. Jock Creek
10. Watermelon Road Revised
11. Panther Branch
12. Spencer Hill
0 1 2
Miles
N
78
43
102
18
69
Oakman
Berry
WALKER CO.
FAYETTE CO.
TUSCALOOSA CO.

Figure 2-9

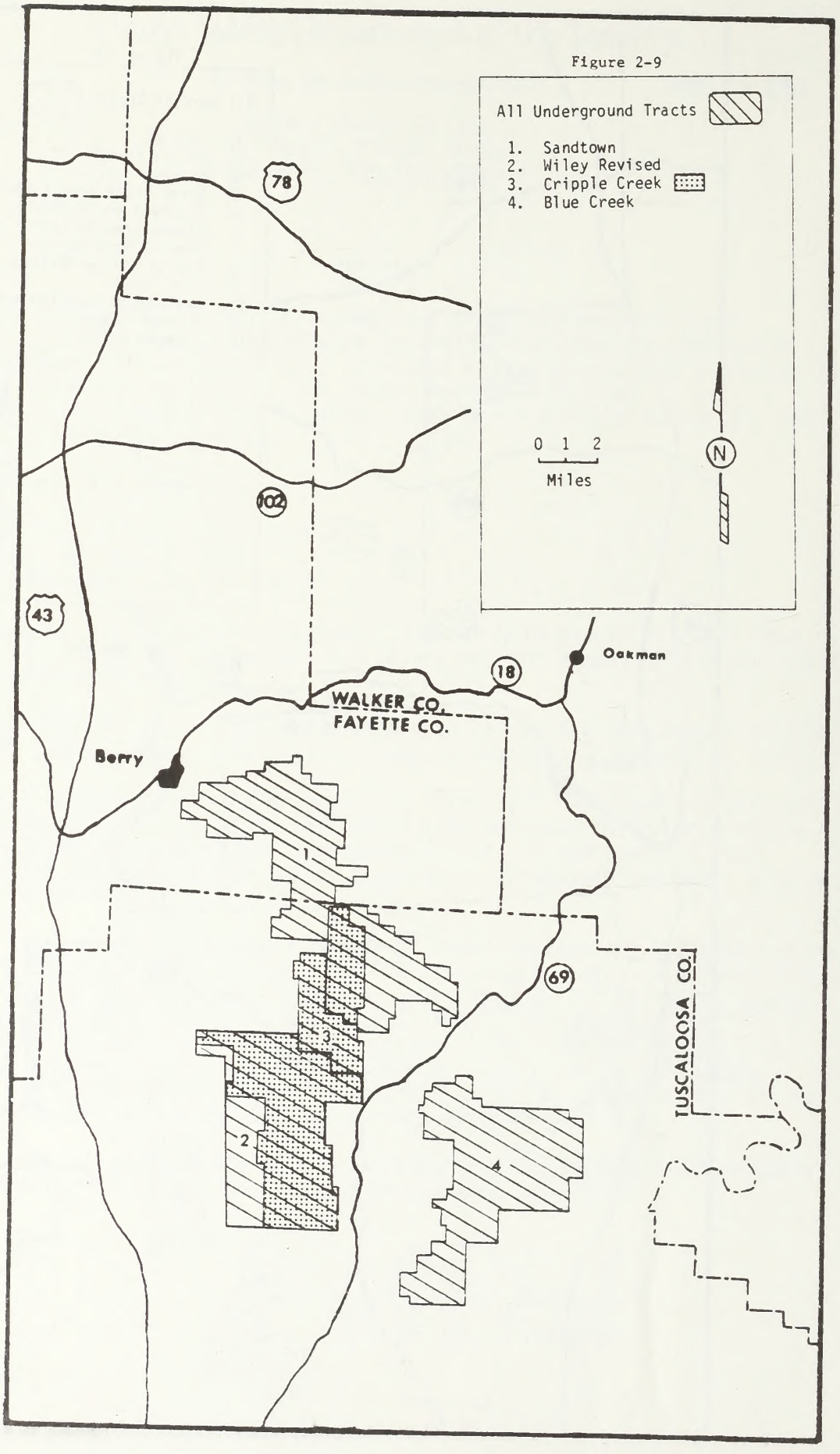

All Underground Tracts
1. Sandtown
2. Wiley Revised
3. Cripple Creek
4. Blue Creek
0 1 2
Miles
N
78
102
43
18
69
Oakman
WALKER CO.
FAYETTE CO.
Berry
TUSCALOOSA CO.
1
2
3
4

Table 2-5. Mineral Resource Values

Alternative Four

Tract (U) - Underground (R) - Revised (S) - Surface	Coal Resource Quantities				Annual Production (Million Tons)
	In-Place		Recoverable		
	Total	Federal	Total	Federal	
Blue Creek (U)	132.6	99.6	79.6	59.8	2.2
Cripple Creek (U)	88.2	31.4	61.7	16.1	1.8
Sandtown (U)	72.9	46	48.5	30.6	1.4
(R)Wiley (U)	106.5	27.3	62.3	15.9	2.1
(R)Bagwell Road (S)	0.99	0.34	0.84	0.26	0.17
(R)Boxes CR Bypass (S)	0.37	0.37	0.34	0.34	0.11
(R) Crabbe Road (S)	0.95	0.43	0.81	0.36	0.2
Jock Creek (S)	2.45	1.09	2.2	0.98	0.5
Lockhart Hill (S)	0.81	0.21	0.73	0.19	0.07
Panther Branch (S)	4.73	1.09	4.25	0.98	0.5
(R) Pendley (S)	0.31	0.31	0.28	0.28	0.11
Pleasant GR Church (S)	0.73	0.30	0.66	0.27	0.4
(R) Poplar Hollow (S)	3.31	1.33	2.81	1.12	0.25
Spencer Hill (S)	2.05	0.62	1.74	0.52	0.25
(R) Watermelon Road (S)	3.44	0.83	3.1	0.74	0.4
(R) Willis Chapel (S)	0.16	0.11	0.14	0.09	0.11
TOTAL	420.5	211.33	270	128.53	10.57

WATER RESOURCES

Because all surface tracts are included in both Alternatives Three and Four, some of the discussion of surface water impacts contained under Alternative Three is virtually unchanged and, therefore, not repeated here.

GROUND WATER

Disturbances to Aquifers - A cumulative total of 33,178 acres of near surface aquifers will be removed or disturbed (table 4-1). An

additional 3,760 acres of subsurface coal beds (potential aquifers) will be removed under Alternative Four in the Wiley underground tract. Depth of mining in the Wiley tract will range from 500 to 1,000 feet below land surface. A fault in the tract strikes north-northwest with a throw of 20 to 80 feet. Subsidence will probably occur to some extent after mining, as discussed under Alternative Two. An estimated 386 wells (table 4-1) and an unknown number of springs may be destroyed or impaired in the various tracts.

SURFACE WATER

Projections of water quality impacts for Alternative Four are given for different time frames in table 2-10. Methodology utilized is described in appendix A. Streams over the Wiley tract may carry more dissolved minerals after mining, as a result of subsidence fracturing and lowering of the water table. Higher average and base flows from areas that are undermined are probably due to increased infiltration, and hence less evapotranspiration, and increased ground-water storage created by subsidence fracturing.

VEGETATION

Adoption of Alternative Four would cause a cumulative loss of 128,560 acres of vegetation. Approximately 5,560 acres of vegetation disturbance would be a result of the Federal action. Other impacts to vegetation would be the same as with the other alternatives, but at a slightly higher magnitude. Implementation of Alternative Four should have no effect on threatened or endangered species.

WILDLIFE

Approximately 3,200 deer and 1,300 turkeys would be lost or displaced as a result of adopting Alternative Four. Of this total, approximately 235 deer and 100 turkeys could be attributed to the Federal action. An additional disturbance of 9,510 acres of wildlife habitat would be attributed to Federal leasing if this alternative is adopted. Implementation of Alternative Four should have no effect on threatened or endangered species.

LAND USE

Under this alternative, an additional 400 acres will be disturbed by the Year 1995. However, reclamation will occur contemporaneously with mining operations. Suitable replacement lands are available in the EIS region. The disturbance of an additional 400 acres is not significant, when considered on a regional land use basis.

The addition of 400 acres under this alternative will have no effect on the discussion of postmining land use or surface owner considerations as presented under Alternative Three. Therefore, the reader is referred to Alternative Three for the discussion of postmining land use and surface owner considerations.

SOILS

Impacts to the disturbed soils are the same as under the all surface and high ranked underground alternative. Total cumulative acreages affected by surface mines in this alternative are also the same: approximately 5,184 acres of soil disturbed by 1995, with about 263 acres of good soils, 2,131 acres of fair solids, and 2,790 acres of poor soils.

CULTURAL RESOURCES

A total of 29 known cultural resource properties could be impacted from mining the 16 proposed tracts under the alternative. The breakdown of these resources by basic category is as follows: 8 prehistoric; 15 historic; 4 multicomponent; and 2 standing folk houses. (Table 3-6 gives a brief description and the cultural affiliation of each resource recorded.) Eleven cultural resource properties are located on the surface tracts with only four of these on minable portions of these tracts. Twenty-four resources are located on the overall surface areas delineated for the underground tracts. Because many of the proposed tracts overlap in surface delineation, there is some duplication of occurrence reflected in the figures above. (See table 3-7 for a listing of tract-by-tract occurrence of known cultural resource properties.)

With the exception of the Revised Boxes Creek Bypass tract, which has been completely inventoried for cultural resources, the remainder of tracts under this alternative range from having had 33 percent inventory conducted, to having had no inventory; the majority of tracts have had less than ten percent inventory conducted within the surface delineated areas (see table 4-6).

Refer to Alternative Two, which contains a discussion of the existing cultural resource data base, NRHP eligibility, and treatment of cultural resource properties in accordance with the Advisory Council on Historic Preservation's PMOA (May 1980 and March 1983).

RECREATION

The impacts are the same as those discussed under Alternative Three.

VISUAL RESOURCES

Alternative Four should have an insignificant impact on visual resources. There are no significant or outstanding visual resources located on any of the tracts considered for this alternative. For supplemental information the reader should refer to table 3-8 in chapter 3, which summarizes the visual resources for all potential second round lease tracts.

SOCIOECONOMICS

Alternative Four would cause a relatively significant additional economic impact over the preferred alternative, with the addition of one

large underground mine. Personal income would increase to $96 million in the mining sector (35 percent increase over the preferred alternative) and $84.6 million for secondary employment (34 percent over the preferred alternative), with respective increases in personnel of 3,264 and 4,711. Severance tax would increase to $2.8 million and Federal royalties to $11.3 million. Population would increase by 505 persons over the previous alternative creating only insignificant impacts on housing and community facilities.

TRANSPORTATION

The ADT and v/c ratios will not increase by a significant amount over levels projected for no action alternative. For more information, check table 4-17, chapter 4. Enough excess capacity apparently exists so that the service level of the roads will not decline. The rail systems could experience an increase between 0 and 56 percent in coal tonnages hauled through the counties.

The barge traffic associated with this alternative would generate an approximate annual increase of 2.220 million tons of coal over the 1980 baseline figure of 10 million. Estimates of tow delays resulting from projected increases in waterborne commerce indicates a lock capacity in the range of 25 to 30 million tons. This limit will not be reached as a result of any of the proposed alternatives.

NET ENERGY ANALYSIS

Evaluation of the energy efficiency of mining under this alternative has shown a production surplus. This surplus is expressed as the ratio of energy produced by mining to the energy consumed by mining in Btus. In the underground tracts, this surplus ranges from 220:1 to 300:1. In the surface tracts, this surplus ranges from 13:1 to 22:1. For details on assumptions and methodology, see appendix E.

Table 2-4. Mineral Resource Values

Alternative Three

Tract (U) - Underground (R) - Revised (S) - Surface	Coal Resource Quantities				Annual Production (Million Tons)
	In-Place		Recoverable		
	Total	Federal	Total	Federal	
Blue Creek (U)	132.9	99.6	79.6	59.8	2.2
Criple Creek (U)	88.2	31.4	61.7	16.1	1.8
Sandtown (U)	72.9	46	48.5	30.6	1.4
(R)Bagwell Road (S)	0.99	0.34	0.84	0.26	0.17
(R)Boxes Cr. Bypass (S)	0.37	0.37	0.34	0.34	0.11
Revised Crabbe Road (S)	0.95	0.43	0.81	0.36	0.2
Jock Creek (S)	2.45	1.09	2.2	0.98	0.5
Lockhart Hill (S)	0.81	0.21	0.73	0.19	0.07
Panther Branch (S)	4.73	1.09	4.25	0.98	0.5
Revised Pendley (S)	0.31	0.31	0.28	0.28	0.11
Pleasant Gr. Church (S)	0.73	0.30	0.66	0.27	0.4
(R)Poplar Hollow (S)	3.31	1.33	2.81	1.12	0.25
Spencer Hill (S)	2.05	0.62	1.74	0.52	0.25
(R)Watermelon Road (S)	3.44	0.83	3.1	0.74	0.4
(R)Willis Chapel (S)	0.16	0.11	0.14	0.09	0.11
TOTAL	314	184.03	207.7	112.63	8.47

CHAPTER 3
DESCRIPTION OF THE ENVIRONMENT

LOCATION AND GENERAL DESCRIPTION

The Alabama Subregion of the Southern Appalachian Coal Region contains about 1.8 million acres in 3 counties (Fayette, Tuscaloosa, Walker) (see fig. 1-1). Nearly the entire acreage of the Subregion is underlain by minable coal (surface, underground, or both). The Subregion lies within the Warrior Basin of the Cumberland Plateau. The Warrior Basin is a large, shallow synclinal structure modified by several smaller scale synclines and anticlines, the Wiley Dome, and numerous north and northwest trending normal faults of generally small displacement. The topography of the area represents a maturely dissected plateau of generally low relief. The topography of the Environmental Impact Statement (EIS) region is characterized by narrow ridgetops, steep slopes, and narrow hollows with nearly level bottoms.

The Warrior Basin contains the Warrior Coalfield which is the largest coalfield in terms of area, production, and reserves in Alabama. The minable coal-bearing rocks are in the upper portions of the Pennsylvanian Pottsville Formation and consist mainly of a rhythmical sequence of sandstone, shales, and coal beds. There are seven recognized coal groups in the Warrior Coalfield. The coal ranges in thickness from a few inches to a little over six feet, and is generally high-volatile "A" bituminous.

Coal is the major mineral commodity produced in the Subregion. The production of natural gas is steadily increasing, with good potential for further increases. Abundant supplies of sand, gravel, and clays are found throughout the Subregion. No historical or unique stratigraphic or paleontologic localities are known in the area.

The soils are low in natural fertility and organic matter and are usually acidic. In terms of area, most of the soils are somewhat droughty, with moderate to slow permeability, and are shallow above bedrock. The high rainfall, steep slopes, moderate permeability, and the shallow, skeletal nature of the soils, all contribute to a severe erosion hazard in disturbed areas.

The Alabama Subregion is part of the Southeastern Mixed Forest Province of the Deciduous Forest Biome, and is primarily composed of various southern pines and upland hardwood species. The dominant species are loblolly and Virginia pines, various red and white oaks, sweetgum, and yellow poplar. Typical understory species include dogwood, several maples, buckeye, various hickories, vaccinia, honeysuckle, ferns, and various herbs and grasses. There are over 2,000 vascular plant species in the EIS area.

Position on the landscape, soil, and management practices are the factors which determine forest composition in the region. Much of the

land overlying the delineated tracts is owned and managed by forest industry. Levels of management vary from custodial to intensive, multiple-use resource management. Surface owned by individuals is generally unmanaged.

The wildlife resources in the Alabama Subregion are typical of the southeastern states. The most common big game animal is the whitetail deer, which is quite common throughout the Subregion. Wild turkeys occur in the Subregion but tend to be more habitat-specific than deer, with the largest populations usually found in mature forest with an open understory and interspersed crown openings. Other game species include fox, gray squirrels, eastern cottontail rabbit, swamp rabbit, bobwhite quail, and mourning dove. All of these small-game species are common to abundant in the Subregion. Waterfowl are uncommon in coal-producing areas, although the wood duck is both a local, breeding resident and a migrant which utilizes stream and water impoundments in the area. Common fur bearers include red and gray fox, striped skunk, beaver, raccoon, opossum, and bobcat.

There are many species of nongame animals in the Subregion and each vertebrate class is well represented. The fish fauna are particularly diverse. Alabama is second only to Tennessee in the number of freshwater species known to occur in a single state. The only federally-listed threatened or endangered species known to occur in the Subregion is the red-cockaded woodpecker, which has been previously recorded on several tracts leased for underground mining during the first round of leasing (BLM, 1979).

The 3 counties, consisting of 1,767,600 acres, are basically rural. Principal urban areas are the City of Tuscaloosa in Tuscaloosa County, the Towns of Jasper in Walker County and Fayette in Fayette County. The City of Birmingham is located at the eastern edge of the Subregion in Jefferson County.

These urban areas are located on the periphery of a 3-county area of concentrated Federal coal ownership. Other small communities and towns are scattered throughout the three counties. The Bureau of Land Management (BLM) is responsible for management of approximately 79,400 acres of federally-owned minerals (principally coal) in the EIS region. The BLM has no direct surface management responsibility in the area, although it does have surveillance responsibility for a 40-acre public purpose area on Lake Tuscaloosa.

All surface associated with the proposed leasing is privately owned. This ownership pattern involves approximately 450 surface owners, both individuals and corporations, in the 3-county area. Private ownership acreages over Federal minerals range from less than one acre to more than 11,000 acres.

The principal land use in the area is unmanaged forest with agriculture being the second most important land use. Coal mining, historically, has been an important land use in the area, since before the Civil War.

DESCRIPTION OF THE ENVIRONMENT

The lands on which the delineated tracts are located were among the last to be settled. This late settlement was due, primarily, to the poorer soils, which resulted from the geology and topography of the area. These lands are characterized by narrow ridgetops, steep side slopes, narrow-winding hollows, and almost level bottoms. Also, there are a few widely scattered, fairly broad ridgetops and small upland benches. Most of the soils occurring in the delineated tracts are low in natural fertility and organic matter. These factors, in conjunction with steep slopes, make the area less desirable for agriculture. As a result, these areas were by-passed by the earliest settlers, and largely remain in forest-type vegetation today.

Major drainage basins in the area are the Upper Tombigbee and Black Warrior Rivers. The average annual runoff for the lease area is about 23 inches or 1 mgd (million gallons per day) per square mile. Most of the smaller tributaries originating on the delineated lease tracts are intermittent. The chemical quality of water in undisturbed areas is relatively uniform and should be suitable for most uses. During low-flow periods, water in tributaries draining mined areas may have a dissolved solids content which exceeds 2,000 mg/l.

The Pottsville Formation is the principal source of ground water. Water in the Pottsville occurs chiefly in bedding planes, fractures, and joints in relatively impermeable indurated rocks. The Coker Formation is a minor source of water in the southern part of the leasing area. Ground water in the Coker occurs in unconsolidated sands and gravels. Well yields from the Pottsville and Coker in coal mine areas are generally less than 5 gpm. Ground water from these wells generally is suitable for most purposes.

The population density of the study are is 81.4 persons per square mile, with a range from 30 persons per square mile in Fayette County to 103.2 persons per square mile in Tuscaloosa County. The total area population is 225,010, which represents just under 6 percent of the state's total population. The age distribution in the area closely approximates that of the remainder of the state, with the largest percentage in each county (and the state) in the 15 to 24 age group.

The communities in the area do not have an abundance of vacant housing, although there are no shortages. However, the 1980 vacancy rates do show some slack, ranging from 7 percent in Tuscaloosa County to 10 percent in Fayette. Area schools have much more room for growth, as do health care facilities, water and sewer systems, and solid waste systems. The systems in which existing levels of service are near capacity are that of police and fire protection.

The attitude of area residents is generally pro-mining and pro-growth, with an understanding of related problems that might occur and a willingness to face them.

CLIMATE AND AIR QUALITY

CLIMATE

The climate of the EIS area is temperate. During the late fall, winter, and early spring, winds are primarily from the northwest and northeast. From late spring to early fall, winds generally prevail from the southeast, south, and southwest. The summers are long, hot, and humid, with few daily temperature fluctuations. During the coldest months, there are frequent shifts between mild, moist, Gulf air and cool, dry continental air.

AIR QUALITY

Ambient concentrations of total suspended particulates (TSP), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), and total hydrocarbons, have been monitored in or near the EIS area. Ambient background concentrations (the pollutant level exclusive of the influence of power plants or other industrial facilities, urban areas, and major roadways) may be estimated by examining and evaluating this monitoring data. In general, these sites provide data more representative of urban areas than of the predominantely rural EIS area.

In accordance with the requirements of the Clean Air Act Amendments of 1977 (42 USC 7401, PL 95-95, 1977), Fayette, Walker and Tuscaloosa Counties have been designated as "attainment/unclassified" for TSP and NO_2 (43 FR 8962, 1978). The entire state is designated as "unclassifiable" for lead (McNider, 1980). These three counties are also designated as "attainment" for O_3.

Total suspended particulate levels in the EIS area are generally below the maximum levels specified by state and Federal regulations. However, the annual TSP standard was exceeded in 1977 and 1978 in Walker County. Maximum annual TSP concentrations reached 82 ug/m^3. The annual standard was not exceeded in 1979. The 24-hour secondary standard was exceeded in 1979. The high TSP levels in Walker County are primarily due to fugitive dust caused by coal trucks driving on unpaved roads (Frentz, et al., 1978). Rural background TSP levels over the EIS area are approximately 40 ug/m^3 (Barrett, 1980, and Duncan, et al., 1979).

Maximum sulfar dioxide SO_2 concentrations monitored in and near the EIS area approximately 30 percent of allowable levels. Background SO_2 concentrations are in the range of 10-20 ug/m^3 (EPA, 1978, and Duncan, et al., 1979). Nitrogen dioxide, carbon monoxide, ozone, and hydrocarbon concentrations were not monitored in the EIS area. However, Birmingham, which is outside the EIS area, was monitored and the results are presented in the previously prepared EIS on pages 53-54. Birmingham lies approximately 50 miles east of the EIS area.

Sipsey National Wilderness Area is the only Class I area in Alabama (42 FR 57460, 1977). This 12,646 acre area is approximately 30 kilometers north of the study area in Winston and Lawrence Counties.

MINERAL RESOURCES

PHYSIOGRAPHY

Most of the Alabama Subregion lies within the Warrior Basin, a broad, synclinal, highly dissected plateau. The Warrior Basin is 80 miles long and 60 miles wide, with elevations ranging from 1,000 feet in the north to 500 feet in the south (Johnston, 1930, and Horne, et al., 1976). On the west and south the remnant plateau surface is covered by the Coastal Plain.

GEOLOGY

The coal-bearing sequence in the Warrior Basin (the Pennsylvanian Pottsville Formation) ranges in thickness from 2,500 feet in the north to over 4,400 feet in the south. A detailed description can be found in Copeland (1972). Faulting in the basin is common, frequently occurring as zones of northwesterly trending normal faults. The formations in the Basin dips gently to the southwest except where disturbed by local faulting or folding (Kidd and Shannon, 1978).

PALEONTOLOGY

The formation exposed on the surface in the Subregion is devoid of fossils, although fossiliferous zones do occur on a limited local scale. No historically unique localities are known to exist in the Alabama Subregion (BLM, 1979).

COAL

There are 7 coal groups containing commercially valuable coals in the Warrior Basin. At least 20 seams within the 7 groups are economically minable at some point (fig. 3-1) (Ward and Evans, 1975). Most Warrior Basin coals are high volatile "A" bituminous, ranging in thickness from a few inches to over 75 inches. Ash content varies from 3 to 15 percent and sulfur ranges from 1.1 to 3 percent. Underground minable seams range in depth from 400 feet to over 1,100 feet in the delineated tracts (MMS/BLM, 1982).

Demonstrated coal reserves in the Alabama Subregion are approximately 220 million tons for surface minable coal and 1,550 million tons for underground minable coal (BLM, 1979, and DOE, 1978). As can be seen by the tonnage figures, in the long run the predominant mining method (per tons mined) will be underground mining. There have been no recorded incidences of subsidence in the 3-county area due to underground mining. No estimate exists of total Federal coal tonnage for the Alabama Subregion.

All 16 delineated tracts are in the Warrior Basin Known Recoverable Coal Resource Area.

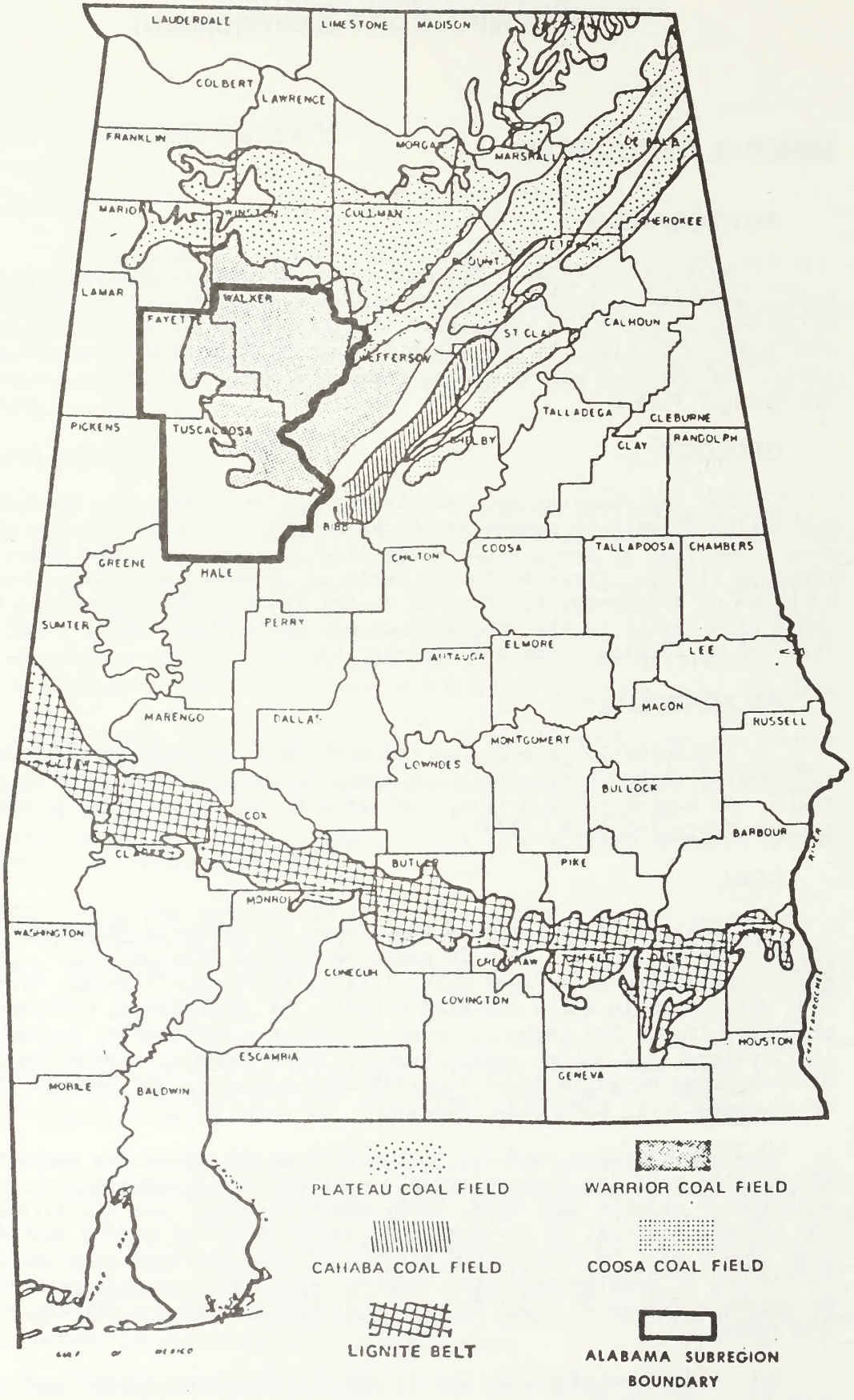


Figure 3-1. Coal Fields in Alabama (Froni (ADO,1975))

OIL AND GAS

Paleozoic rocks underlying the Subregion are producing economic quantities of natural gas and some oil from 8 horizons ranging in depth from 1,300 to 3,700 feet. For a more detailed discussion of this resource, see BLM, 1979.

Natural gas associated with the Mary Lee coal seam is being produced from degasification fields in western Jefferson and eastern Tuscaloosa counties. The Mary Lee is estimated to contain over 1 trillion cubic feet of natural gas (Diamond, et al., 1976).

CLAY, SAND AND GRAVEL

The supply of clay, sand, and gravel is more than sufficient to meet present and future demands, although specific reserve figures are not available (BLM, 1979).

WATER RESOURCES

The Warrior Coalfield is in the Black Warrior and Upper Tombigbee River basins with the latter draining only the westernmost edge of the area. The land surface within most major basins is dissected by tributaries forming numerous subbasins. All but the northernmost delineated tracts (fig. 4-2) are in subbasins draining to the Black Warrior River. Most existing and potential coal mine areas within the area of study have similar physical settings which result, or will result, in similar water resource problems.

Streamflow characteristics are determined by climatic, physiographic and geologic conditions, and stream-regulating conditions imposed by man. In a broad area where conditions determining streamflow characteristics are similar, basins may have similar low, median, and flood-flow characteristics. Many streams in the coal mining regions of Alabama do not have well-sustained flows. This is characteristic of basins underlain by soil or rocks that inhibit the storage of ground water. Streamflow recedes rapidly from sharply concentrated flood peaks to low flows, or even no flow between storms. The median annual 7-day low flows (2- and 10-year recurrence intervals) approach or reach zero in all but the southernmost part of the leasing area.

Based on USGS records for several sites, the average discharge for streams in the leasing area ranges from 1.31 cubic feet per second per square mile (cfs/mi^2) to 1.62 cfs/mi^2. Most subbasins draining coal lease tracts have drainage areas ranging in size from 1 to 5 mi^2. Average runoff from them during a flood with a 2-year recurrence interval generally would range from 280 to 800 cfs/mi^2, and during a flood with a 25-year recurrence interval, generally would range from 580 to 2,000 cfs/mi^2 (Olin and Bingham, 1977).

Water in streams in the Warrior Coalfield that are unaffected by man's activities is generally of good chemical quality (see appendix D,

table D-1). Impacts from coal mining have been significant only in tributaries to the major streams. The degradation of water quality, the most severe and long-term impact, is greatest in the immediate vicinity of mining. This impact decreases progressively as water moves away from mined areas, and in the Black Warrior and Sipsey Rivers is dissipated to a large degree by large volumes of streamflow from unmined areas.

Lake Tuscaloosa on North River and Lake Nicol and Lake Harris on Yellow Creek are public water supply reservoirs in the EIS area. Lake Harris has been affected by sediment from strip mining, and Lake Tuscaloosa has been affected slightly by man-induced pollution. A summary of the hydrology of Lake Tuscaloosa is given in appendix B.

Baseline conditions pertaining to water quality in subbasins, draining delineated Federal coal lease tracts, are given in appendix D. Sites in these subbasins (fig. 4-2), some already affected by mining, were selected to evaluate conditions and probable impacts before dilution or obscuring inflow of other mine drainage in downstream areas. For sites affected by mining, projected values for water quality constituents or physical properties were made for a near average discharge (1.5 cfs/mi^2) and a low flow (0.1 cfs/mi^2). Methods utilized to make projections are described in appendix A.

Aquifers in the Pottsville Formation are the principal, and in many areas the only, source of ground water in the Warrior Coalfield. They yield water of adequate quantity and quality (see appendix D, table 2) for domestic use and for small public supply and industrial uses. Locally, aquifers in the Coker Formation in the southernmost tracts are sources of similar or larger supplies. Mineralized water from coal mines has locally affected aquifers in the Warrior Coalfield. The degree and extent of the impact is unknown.

Estimated water use in Tuscaloosa, Fayette, and Walker Counties, where all delineated tracts are located, is given in table 3-1.

Table 3-1. Estimated Water Use in Millions of Gallons Per Day (mgd) in 1980 by County

	Public Supply-Average Water Use (mgd)		Rural Supply
	Ground-Water	Surface Water	Principally Ground water
Fayette	0.19	0.52	1.60
Walker	2.53	4.21	7.36
Tuscaloosa	4.93	16.6	5.76

Source: Use of Water in Alabama, 1975, With Projections to 2020, M.F. Mettee, P.H. Moser, Lewis Dean, Geological Survey of Alabama Information Series 48; and U.S. Environmental Protection Agency: Population Projections. 1980

VEGETATION

The Alabama Subregion of the Southern Appalachian Coal Region lies in the upper portion of the oak-hickory-pine forest (Kuchler, 1975) in the Deciduous Forest Biome. Primary vegtation types include mixed pine-hardwood, southern pine, upland hardwood, and riparian forests. Present forests within the Subregion have been logged repeatedly or cleared for agriculture, surface mining and rights-of-way; therefore, native vegetation has been modified to various degrees.

Mixed pine-hardwood forest is the most common vegetation type in the area (Chermock, 1977), occurring on narrow ridges and side slopes. Common species include chestnut oak, southern red oak, white oak, post oak, Virginia pine, loblolly pine, and hickories. Dogwood, sourwood, and huckleberries are common in the understory.

Pine forests generally occur on hilltops and upper slopes, but are sometimes found in riparian habitat. Dominant species include Virginia, loblolly, and shortleaf pine, with occasional long-leaf pine in the southeast portion of Tuscaloosa County. Several species of hickory and upland oaks, red maple, blackgum, flowering dogwood, and sourwood are common associate species. Intensively managed timber plantations contain almost entirely loblolly pine, the most important species of softwood growing stock (USDA, 1980).

Riparian ecosystems occur along perennial and intermittent streams and are classified as "palustrine, forested, broad-leaved deciduous, and temporarily flooded" by the U.S. Fish and Wildlife Service (Cowardin, 1978). Representative species include yellow poplar, American beech, white oak, water oak, sycamore, sweetgum, and red maple. This vegetation type supports a greater diversity of wildlife than most nonwater-related habitats, and is regarded as the most productive or preferred habitat type for many important species, including white-tailed deer, turkeys, and migratory birds (Brinson, 1981). In the upland hardwood forest communities common species include several species of hickory, several species of oak (the most common being chestnut oak and white oak), black cherry, red maple, flowering dogwood, and sourwood (Johnson and Sellman, 1979).

See table 3-2 for the acreage of each vegetative type on the surface tracts. Nonforest vegetative types (disturbed, cleared and clear cut areas) comprise about 13 percent of the delineated acreage. Cleared lands include agricultural lands, residential areas, and various rights-of-way. Disturbed lands include unreclaimed surface mines where vegetative cover is sparse or lacking. Clear-cut lands generally are in grassland seral stages which follow recent timber harvests. These areas, if left undisturbed, will rapidly revegetate through successional stages into one of the forest types previously discussed.

In the Alabama Subregion, the site index of a common tree species (the height a dominant tree is expected to attain in 50 years) is a

convenient gauge of plant productivity. On the delineated tracts, the site index for loblolly pine ranges from 94 on level bottomland areas to 56 on steep side slopes. A majority of the area exhibits site indexes for loblolly pine in the low to medium range (60-75) (Soil Conservation Service, 1965).

The State of Alabama has no official list or legislation dealing with protected plants.

WILDLIFE

There are 44 species of resident mammals occurring on delineated tracts and four species of migratory bats that occur in the area for only a portion of the year (Holleman, 1963, and Yales, 1956). Viable populations of important game species, including whitetail deer, fox, and gray squirrels, and eastern cottontail and swamp rabbits, occur in the Subregion. The most important limiting condition for those species that require several different habitat types may be a lack of edge or forest openings. However, species such as the gray squirrel and swamp rabbit, which have more restrictive habitat needs, are dependent on the specific vegetative types that provide their life needs.

Of the 175 species of common birds found on the delineated tracts, 58 are permanent breeding residents, 48 occur in the summer only, 31 occur in the winter only, and 38 are migrants only (Imhoff, 1976). In addition, there are approximately 80 additional species that occur in the Subregion, but are unlikely to be found in the areas that might be leased. Game species include wild turkeys, bobwhite quail, and mourning dove. Eight species of migratory birds of high Federal interest are listed for the Alabama Subregion. Ten bird "Species of Special Emphasis" (USFWS, 1982) are listed for the Alabama Subregion. Six of these species -- mourning dove, red-headed woodpecker, pileated woodpecker, eastern bluebird, American woodcock, and wood duck -- occur on one or more of the tracts. The following migratory species also occur on one or more tracts: Cooper's hawk, green heron, Bachman's sparrow, and Bewick's wren. Seventy-nine species of reptiles and amphibians also occur in the area (Mount, 1975). Also, a number of potentially endangered and threatened plants have been listed by Boschung (1976).

Several species of each vertebrate class mentioned above occur in virtually all of the habitats available in the area. Refer to the wildlife and zoology text and papers cited in the bibliography for a complete listing and information on the life history, preferred habitats, and relative abundance of all the species occurring in the EIS area. Wildlife habitat management for game species in the Subregion is limited to Piney Woods Wildlife Preserve (Gulf States Hunting Area) and the State-managed Wolf Creek Wildlife Management Area, both of which overlap some tracts.

Forty-three species of fish are known to occur in the small to medium streams that are typical of those on or draining the delineated tracts

(Barclay and Howell, 1973, Boshung, 1973, and Mettee, et al., 1981). An additional 27 species are found in the Black Warrior River and other deep water habitats near the area subject to leasing (Mettee, 1978, and Smith-Vaniz, 1968). Common game species include large mouth bass, spotted bass, several species of sunfish, and channel catfish.

Federally listed endangered species known to occur within the Fayette, Tuscaloosa, and Walker county proposed lease areas are: (1) the bald eagle, which winters along the Black Warrior River southeast of the delineated tracts; (2) the Peregrine falcon, which is a rare winter migrant; and (3) the red-cockaded woodpecker, which was reported on several Federal tracts leased for underground mining during the 1981-82 lease sale. A recent inventory (January 18-19, 1983) of areas within the proposed lease tracts estimated to have the greatest potential for the occurrence of red-cockaded woodpeckers revealed no populations or cavity sites (reference attached memorandum dated January 20, 1983, to Manager, Tuscaloosa Office, from Jack Hill, Hydrologist).

Based on a review of existing habitat and past distribution records, other endangered species that may occur on the proposed lease tracts include the eastern cougar (a wide-ranging predator for which there have been a number of non-verified sightings within the three-county lease area over the past several years) and Backman's warbler (previously known to nest in Tuscaloosa County, but possibly extinct in Alabama). Consultation, as mandated by Section 7 of the Endangered Species Act, has been completed with the U.S. Fish and Wildlife Service.

The flattened musk turtle, which is being evaluated by the FWS for possible listing under the Endangered Species Act, has also been reported from several streams and reservoirs within the Fayette, Tuscaloosa, and Walker county lease area (Mount 1981).

LAND USE

The three counties, basically rural, consist of approximately 1,777,300 acres. The three principal urban areas are the Cities of Tuscaloosa in Tuscaloosa County, Jasper in Walker County, and Fayette in Fayette County. These urban areas are located on the periphery of the area of concentrated Federal coal ownership. Other small communities and towns are scattered throughout the three counties.

Table 3-3 shows the major land uses by county for the EIS area. Forest and agricultural uses account for 96 percent of current land use.

Table 3-3. Major Land Uses (Acres)

County	Urban & Buildup	Agri-culture	Forest	Other 1
Fayette	1,206	65,130	333,290	2,412
Tuscaloosa	13,692	111,244	711,963	18,826
Walker	5,686	71,338	414,073	25,330
Total	20,584	247,712	1,459,326	46,568
Percent Total[2] Study Area	1.6	13.96	82.25	2.62

1. Includes water, wetlands and barren.
2. Figures do not total 100 due to rounding.
Source: Alabama County Data Book 1981, Office of State Planning and Federal Programs

The predominant land use in the area is forest, comprising about 82 percent of the total land surface. Agriculture is the second principle land use in the counties. However, only a limited amount of acreage in the vicinity of the delineated tracts is used for agriculture.

Surface mining, historically, has been an important land use in the three counties. While other mining operations, such as gravel mining, have occurred, coal mining has accounted for the vast majority of all acres disturbed by mining. Other land uses include urban transportation, utilities, limited public purpose areas, and a few communication sites.

LAND OWNERSHIP

The Federal Government holds title to approximately 79,086 acres of coal rights within the 3-county area. Within the three counties, 1,698,214 acres of coal rights are owned by individuals, companies, or the State of Alabama.

Several agencies of the Federal Government hold title to 11,288 acres surface in the 3 counties, along with the mineral rights to most of these lands. The BLM does not have surface management responsibility for any land within the area, but does have compliance surveillance responsibility for a 40-acre recreation and public purpose tract on the shoreline of Lake Tuscaloosa. The remainder of the land is managed by the Corps of Engineers, the Forest Service, and the Department of Defense. None of these federally-managed lands are included in any of the delineated tracts.

The remainder of the land is privately owned or state owned. Table 3-4 shows this ownership.

Table 3-4
Land Ownership, By Sector

Ownership	Fayette	Tuscaloosa	Walker	Total
Private	391,480	835,912	503,760	1,731,152
State	9,820	10,400	14,640	34,860
Federal	0	11,288	0	11,288
Total	401,300	857,600	518,400	1,777,300

Source: North Central Alabama Land Use Analysis, 1979

One of the most significant ownership patterns is the amount of acreage of surface over Federal minerals, owned by private industry, and individuals owning over 500 acres. Table 3-5 depicts this ownership pattern.

Table 3-5
Large Landowners Over Federal Mineral Ownership

Type of Owner	Fayette	Tuscaloosa	Walker	Total
Industry	13,360	19,360	4,320	37,040
Individuals Owning More than 500 acres	4,000	2,120	0	6,120
Total	17,680	21,480	4,320	43,160

The ownership pattern depicted above accounts for over 54 percent of the total surface ownership over Federal minerals in the 3 counties. The remaining surface over Federal minerals is owned almost exclusively by individuals.

SURFACE OWNER CONSIDERATIONS

Courthouse research was conducted to determine the present owners of lands over FMO within delineated tracts. In very few cases has the ownership changed since the North Central Alabama LUA. In those cases where there was a change, the new surface owner has previously been a surface owner over FMO, and expressed a preference for surface mining, or the new surface owner is a company involved in surface mining coal.

RELATIONSHIUP TO LAND USE PLANS

Table 3-6 summarizes the land use planning and controls data for the 3-county area.

SOILS

The soils in the EIS area are located on narrow ridgetops, steep slopes, and narrow hollows with almost level bottoms. These soils developed from the following types of parent materials: 1) residual material from sandstone, shale, and siltstone of the Pottsville Formation, and 2) residual material from unconsolidated clays, silts, and sands in the form of alluvium and colluvium, transported by wind, water and gravity. Most of the mineral nutrients necessary for high soil productivity have been leached from the rooting zone and/or carried off in the runoff. This condition exists because of the parent materials from which the soils were formed and the high amount of rainfall (50-60 inches per year). Also, due to high temperatures and periodic fires throughout the years, most of the organic matter present has been oxidized, so very little is left to build up in the soil. With very little organic matter or clay-size material in the soil, the amount of water which can be retained by the soil is reduced, which also tends to reduce the productivity of the soil. Low water holding capacity, high rainfall, and steep slopes all contribute to the high erosion potential of the soils on the tracts. Presently, topsoil is easily eroded by surface disturbance.

Soil data and information was obtained from the Soil Conservation Service (SCS), published Soil Surveys of Fayette, Tuscaloosa, and parts of Walker and Jefferson Counties. Table 3-7 shows percentages of each soil type tract for all 12 surface tracts.

CULTURAL RESOURCES

In general terms, "cultural resources" can be defined as fragile, non-renewable remains of past human activity which represent a part of the continuum of events from the earliest evidence of man to the present day. More specifically, the term "cultural property" means any definite location of past human activity, occupation, or use, identifiable through field inventory (survey), historical documentation, or oral evidence. Cultural properties may include archaeological, historic or architectural sites, structures, places, sites of places, or cultural groups, whether or not represented by physical remains. Management of cultural properties is through a combined system of inventory, evaluation, protection, and utilization.

Although there is good potential that undiscovered cultural resources may exist on each of the proposed lease tracts, total inventory of each tract has not been conducted at the present time. Stipulations will be placed on each lease to require inventory of affected areas of the lease tracts and mine plan areas.

Most of the data concerning cultural resources over Federal coal in the 3-county area has not changed significantly since the publication of

the first EIS. The primary source of cultural resource data for the EIS study area (approximately 74,000 acres) is a report based on an inventory prepared for the North Central Alabama LUA. This 1978 study of cultural resources on Federal mineral lands was conducted by the Office of Archaeological Research (OAR), of the University of Alabama (Moorehead, Coblentz and Gillespie, 1978). The report includes a prehistoric and historic overview plus results of a 10 percent stratified sample inventory of the 66,120-acre core survey area. At the time of this inventory, previous survey work in the region had been extremely limited, particularly in the upland settings where Federal coal is located; most research had been concentrated on bottomland areas. No cultural resources had been recorded previously on surface over FMO, but the 1978 inventory located 82 cultural resource properties on or near FMO in the potential coal lease area. Since that time, two intensive inventories for coal permit lands in northeast Fayette County, Alabama have been conducted by OAR (Oakley, 1979; Mistovich, Herbert, Willingham, 1982). These inventories covered 2,260 FMO acres and 1,040 acres of surrounding area. Sixteen additional cultural resource properties were recorded during this inventory.

At the present time there are well over 400 known cultural resource properties located within the entire 3-county region; about 114 are located in the upland areas of these counties. Twenty-nine known resources could be affected by the proposed Alternatives Two, Three, and Four. (Refer to tables 3-8 and 3-9 for supplemental information concerning cultural resource type and tract occurrence.) There are few known cultural properties located on minable areas within each of the proposed second round lease tracts. The few that are recorded in the area have low potential for eligibility to the National Register of Historic Places (NRHP); however, official determinations of eligibility have not been made at this time.

PREHISTORY

Prehistoric period resources in the general region tend to be primarily lithic scatters or isolated finds which represent single or multiple occupation camp sites or upland food processing stations. Occupation of these sites began prior to 8000 B.C. and ended about A.D. 1650. The majority of prehistoric properties recorded in the 1978 inventory were relatively small, with a low artifact density.

Based on the inventory results, it is concluded that prehistoric sites in the area tend to cluster in an area approximately 201 to 400 meters from the nearest water source, primarily first order streams. The sites are also most commonly found in level areas of ridge knolls, spurs and fingers. Most of these sites were discovered by visual observation in logging roads and exposed clear-cut areas. A total of 63 known prehistoric properties, or components of properties, have been recorded in the study area. Resources of this type can provide scientific information on questions of subsistence, population movements, and sequences of cultural affiliation of the region.

SOUTHERN APPALACHIAN REGION

HISTORY

Historic period resources in this area are related primarily to Euro-American frontier settlement, particularly marginal subsistence farming and homesteading. The culture of the early Euro-American settlers in the Warrior Basin was characteristic of a more widespread pattern known as Upland South Culture. This culture was a way of life which began prior to 1800 and was practiced by non-aristocratic, largely nonslave holding settlers of Scottish, Irish, Welsh, English, and German peasant ancestry in southern Pennsylvania, the Shenandoah Valley, western Carolina, and eastern Tennessee. Material characteristics of their way of life include log houses, open range livestock raising, and dispersed agrarian settlements.

Historic sites will normally be found on upland ridges with the majority at elevations of 151 to 250 meters above mean sea level (now referred to as NGVD of 1929) . Water source does not appear to have been a major consideration in site location, probably due to Euro-American use of well technology. There are 51 known historic properties (or components of properties) recorded in the general EIS area. Several significant historic structures in surrounding vicinities are listed on the NRHP. The nearest of these structures is the Gilchrist-Winchester Home, a two-story frame house located in Walker County. This house is believed to be the oldest farmhouse in the state (ca. 1812). There are no NRHP properties located on any of the proposed lease tracts.

RECREATION

The BLM has no direct surface management responsibility in the EIS region. However, the Corps of Engineers (COE) and the Forest Service maintain public use areas in Tuscaloosa County. The COE lands consist of about 1,560 acres along the Black Warrior River. The Forest Service lands are that portion of the Talladega National Forest that extend into Tuscaloosa County, comprising approximately 8,555 acres. The nearest tract lies approximately 25 miles north of the Forest Boundary.

The only recreational opportunity present in those portions of the three counties with high FMO is hunting. The characteristically steep terrain, dense vegetation, and low population density are factors that impede development of recreational sites and formal recreation in these areas.

Six undeveloped management areas offering public use are located in the three counties. Four of these areas are privately owned by companies that operate in the timber, paper, or minerals industries. The recreational use of the four privately-owned management areas is subject to change without notice, as the landowners exercise their right to use the land for primary management programs.

The Wolf Creek Management Area is a free use public hunting area. The Game and Fish Division has hunting leases on approximately 31,000

acres. Most leases are for 10 years and expire in 1987, but a few are renewed annually. Recreational opportunities are limited to hunting, camping, and picnicking. During the 1979 hunting seasons, a total of 4,675 hunter days were spent hunting all types of game allowed for hunting in the Wolf Creek Management Area (unpublished data, Alabama Department of Conservation and Natural Resources). The 1985 projection on hunter days may reach a total of 9,150 days (U.S. Fish and Wildlife Service, Annual Performance Report, "Wolf Creek Management Area 1979-80").

The portions of the three counties with high FMO are basically devoid of designated public recreation sites. However, there are a number of hunting clubs that lease private lands for recreational use. In these areas, the primary recreational opportunities are big and small game hunting, and fishing. Dispersed/informal recreation occurs throughout the EIS region. Very little research has been done on this type of recreation and no meaningful use data have been compiled.

VISUAL RESOURCES

During the North Central Alabama LUA, 552,960 acres within the EIS region were inventoried and evaluated for visual resources (see table 3-10). These inventoried areas include lands with FMO. (Claude Terry and Associates, May 1978).

To the maximum extent possible, visual resources were considered during the 1982 second round tract delineation. The BLM has no direct visual resource management (VRM) responsibility within the 3-county area since BLM does not possess surface management responsibility. Surface owners may change the scenic quality of their property at their own discretion.

SOCIOECONOMICS ENVIRONMENT

POPULATION

Detailed population data is presented in the "Southern Appalachian Coal Leasing Project/Socio-Economic Study (SACLP/SES) (Alabama A&M University, 1983). The following section summarizes those findings. The counties of Tuscaloosa, Fayette, Walker, and Jefferson, had a population of 896,334 in 1980 which represented approximately 23 percent of the state's population. Of this total, Jefferson County (Birmingham) accounted for approximately 75 percent of the area's total population.

The racial composition of the population was approximately 30 percent nonwhite in 1960, 26.43 percent in 1970, and 30 percent in 1980. Between 1960 and 1970 the number of nonwhites in the area declined by 16,788 but increased by 25,829 between 1970 and 1980. The area has a relatively

larger nonwhite population than the state as a whole. Jefferson County accounts for the largest source of nonwhites in the area, with 33.3 percent (223,759) of the population nonwhite. The county alone accounted for approximately 83.3 percent of the nonwhites in the area in 1980.

Between 1970 and 1980 the 4-county area grew by 7.2 percent. This compares to a 12.9 percent growth rate for the state as a whole. The largest portion of the region's population growth is associated with an 18.5 percent increase in Tuscaloosa County, and a 22.1 percent increase in Walker County.

The population of the study area was largely urban (80.7 percent) in 1980. However, there is a great deal of variation within the area. For example, Fayette County is 28.8 percent urban, Walker County 26.0 percent, Jefferson County 89.4 percent, and Tuscaloosa County 74 percent. For the state as a whole, the percent urban in 1980 was 60.0.

AGE DISTRIBUTION

The study region has a slightly smaller proportion of its population under age 19, relative to the state, while it has a slightly larger proportion of the population over age 65. Additional information is contained in the SACLP/SES (Alabama A&M University, 1983).

EDUCATIONAL CHARACTERISTICS

In general, the study area reflects two distinctive educational characteristics. The two urbanized counties show a higher number of median school years' completed than is shown in the two rural counties. In 1970, Tuscaloosa and Jefferson Counties showed 11.3 and 11.6 median years' completed, respectively, while Fayette and Walker reflected 9.5 each, an approximate difference of two years.

EMPLOYMENT AND INCOME

The SACLP/SES (Alabama A&M University, 1983) contains detailed information about employment and income in the 3-county area. The following section summarizes the highlights.

The occupational category of mining and quarrying is relatively unimportant statewide (1.2 percent); however, it is important to regional employment in relation to total non-agricultural employment (e.g., Walker County 33.4 percent, Fayette 13 percent, Tuscaloosa 6.8 percent, and Jefferson 1.9 percent). In addition, 75 percent of the state total for mining and quarrying is located in the study area. Major occupational categories, by county, are as follows: Fayette - manufacturing, trade, mining; Jefferson - trade, manufacturing, service;
Tuscaloosa - government, trade, manufacturing, service; and
Walker - manufacturing, mining, trade.

Mining is relatively more important in the state as a source of income (2.4 percent) than as an occupational category. It accounts for a substantial source of income in the study area (i.e., Fayette estimated

to be approximately 26.7 percent; Jefferson 2.9 percent; Tuscaloosa 13.6 percent; and Walker 54.7 percent). Major sources of income by county are as follows: Fayette - manufacturing, mining; Jefferson - manufacturing, trade, services; Tuscaloosa - government, manufacturing, trade, services; and Walker - mining, manufacturing, trade.

The unemployment figures, by county, for January 1983 are as follows: Fayette - 1,299 persons, or 13.2 percent; Jefferson - 50,366 or 16.2 percent; Tuscaloosa - 8,086 or 14.4 percent; and Walker - 5,833 or 18.0 percent (State of Alabama Employment Service, personal communication).

These figures reflect the ability of the counties in the study area to absorb new industrial growth. Mining is an attractive source of growth, as the average miner usually earns approximately two times what the average "other wage and salary employee" earns (e.g., in 1981 average "other wage and salary" employee earned $14,853, and miners averaged $23,026) (Alabama Economic Outlook 1982, Office of State Planning and Federal Programs).

The State of Alabama has a relatively low incidence of coal mine fatalities each year, with only 4 in FY-81 and 5 in FY-82. These annual death rates yield a ratio of 1 fatality per 5.8 million tons of coal mined in FY-81 and 1 fatality per 5.5 million tons mined in FY-82. The majority of the accidents were a result of employee negligence or failure to follow prescribed standards or regulations.

HOUSING

The U. S. Bureau of Census recorded a total of 344,736 housing units in the study area in 1980. Of these, 343,033 are characterized as year round housing units, with the remainder (1,703 units) categorized as seasonal and migratory units. Of the year round housing, 21,471 units were vacant. Additionally, housing costs are considerably lower than the national average. SACLP/SES describes the number of units and vacancy rate by county (Alabama A&M University, 1983).

INFRASTRUCTURE

The infrastructure elements addressed in this socio-economic analysis include schools, health facilities, police protection, fire protection, water capacity, sewer capacity, solid waste and housing (addressed above). SACLP/SES gives a breakdown of the existing situation in each of these elements by community and county (Alabama A&M University, 1983).

SOCIAL SERVICES

Table 3-11 illustrates financial welfare data for the 4-county study area. The area accounts for 23 percent of the state's total financial welfare recipients, 19 percent of the total food stamp recipients and 25 percent of the unemployment compensation recipients (Department of Pensions and Securities, 1979).

PUBLIC FINANCE

A financial summary for each of the four counties in the study area is contained in the SALCP/SES (Alabama A&M University, 1983). The largest group of county tax revenues is typically the property tax. However, revenues from the sales tax often equal, and in some cases surpass, property tax collections. After the property and sales tax, no one county tax is predominant. Taxes on tobacco, beer, gasoline, and business licenses each provide varying amounts of revenue to county coffers. The state-initiated severance tax (enacted in 1977) levies a uniform rate of $.20 per ton of coal, with the proceeds of the tax distributed to counties on the basis of the amount of coal mined from these jurisdictions. (An additional $.135 per ton has been collected to finance the State Docks in Mobile.) During Fiscal Year 1977, Walker County received $1.22 million, Fayette County $250,000 and Tuscaloosa County $1.059 million. Communities receiving this revenue included Birmingham ($17,182.57), Tuscaloosa ($15,935.24), Brookwood ($48,254.04), Carbon Hill ($12,505.87), Jasper ($1,095.98), and Oakman ($4,028.82).

Municipal revenue for the communities in the study area is summarized in table 3-12 (Alabama League of Municipalities, 1978). The major source of municipal revenues accounts for three-fourths of the total local revenues. Municipalties rely very heavily on consumption-based sales and excise taxes as their major tax revenue sources, with relatively little utilization of property tax. Municipal income tax (occupational tax) is used even less, with Birmingham as the only community in the area using this type of tax.

SOCIAL ATTITUDES

The general attitudes, values, and expectations of local citizens and groups/associations are well documented in the "SACLP/SES (Alabama A&M University, 1983). To summarize, the general attitude of local citizens toward mining is one of ambivalence. There is a clear recognition of the positive impacts of mining, which are basically opportunities for jobs and incomes. On the other hand, people are unsure or fearful of the mining industry based on the potential for environmental damage and past ineffectiveness of environmental and safety laws. The study found that, currently, the perceived basic economic benefits from mining appear to override all other attitudes and expectations. These findings confirm those of a previous study "Socio-Economic Study and Analysis of a Four-County Area in North Central Alabama (The Natelson Company, 1978).

Based on interviews with political, civic and industrial leaders of the 4-county study area, community attitudes can best be summarized by the following statements relating to an expansion of coal extraction:

- deep mining as a job oriented economic stimulant is preferred to stripping operations

- community services and facilities are capable of handling such increased activities

- in-migration of workers would not be a problem and, based on the availability of miners in the areas jobs, could be filled by local residents

- BLM leases for strip mining operations could result in an improved environment if leases were limited to former workings and if land reclamation rules and regulations are rigidly enforced

- mining rules and regulations must be adhered to, including those dealing with maximum truck loads on rural secondary roads and on city streets

- increased mining activities have, in the past, resulted in a reduction in the incidence of reported crime

- increased mining has resulted in increased revenues to the respective municipalties and the economic "ripple effects" have contributed to economic as well as political stability

- the advantages of increased mining outweigh the limited disadvantages, which relate to a lack of enforcement rather than to the mining activities themselves

- there is a need to coordinate local, state, and Federal licensing, inspection, collection and enforcement activities during all phases of such mining activities

TRANSPORTATION

Alabama is served by 1,099 miles of navigable waterways, 4,947 miles of railroad, and 25,842 miles of public highway which allowed for the efficient movement of the nearly 26 million tons of imports, exports, and internal movements of Alabama coal in 1981. Tramways, conveyors and private railroads were also used to a lesser extent; however, exact figures of coal transported by each are not known. Barge transportation dominates deliveries of coal to the Port of Mobile, but rail shipments are increasing. According to Port of Mobile officials, in 1980 barge and rail shipments accounted for 78.2 and 21.8 percent of deliveries, respectively, and in 1981, 78.6 and 21.3 percent. (Alabama Coal Data for 1980 and update of 1981).

HIGHWAYS

Transportation of coal by truck is the most expensive mode of delivery per ton-mile from mine to consumer (Survey by the Energy Resources Division of the Geological Survey of Alabama, 1979). Therefore, coal hauled by truck rarely travels more than 100 miles and on an average not more than 50 miles. Coal transported more than 50 miles is predominately hauled by rail and barge facilities.

Trucks are used primarily for short-term haulage between the mine and rail or water bulk-loading facilities. Approximately 75 percent of all

coal movements were made by truck; however, only 15 percent of the total origin-to-destination movements were made by truck in 1980. (Alabama Coal Data for 1980). The road network in the 3-county area is shown on figure 3-2.

RAILROADS

Alabama's rail system is well developed and service is available in most portions of the state. The counties of Fayette, Tuscaloosa, and Walker are served by four major railroad companies and are all Class 1 rail lines. (Source: Alabama Development Office). See figure 3-3.

Norfolk Southern Corporation alone operates seven unit coal trains in the area. Four of these trains originate in the 3-county area. The remaining three trains travel through Walker County on a route between Pride, Alabama, in Colbert County, and various generating plants operated by the Georgia Power Company (personal communication, Mr. W. M. Kellairis, Norfolk Southern Corporation, 1983).

WATERWAYS

The Black Warrior River is an important transportation system in the area. A variety of commodities are barged along this river, including coal. The Black Warrior joins the Tombigbee River at Demopolis, Alabama, and the system is navigable from Birmingport to Mobile.

The actual sizes of the barges vary, but they are generally either regular 900-ton or jumbo 1,400-ton. The number of barges in tow on the Black Warrior-Tombigbee River system ranges from 2 to 6 barges in a tow. Average speed for coal traffic on the Black Warrior and Tombigbee Rivers is 6.67 mph downstream and 4.51 mph upstream.

The William B. Oliver Lock and Dam, located on the Black Warrior River in the western Tuscaloosa metropolitan area, is representative of the southern end of the study area. In 1980, aproximately 10 million tons of coal passed through this lock. The lock has the capabilities to handle at least 20 million tons per year in the future. (Glenda Smith, Corps of Engineers, 1983).

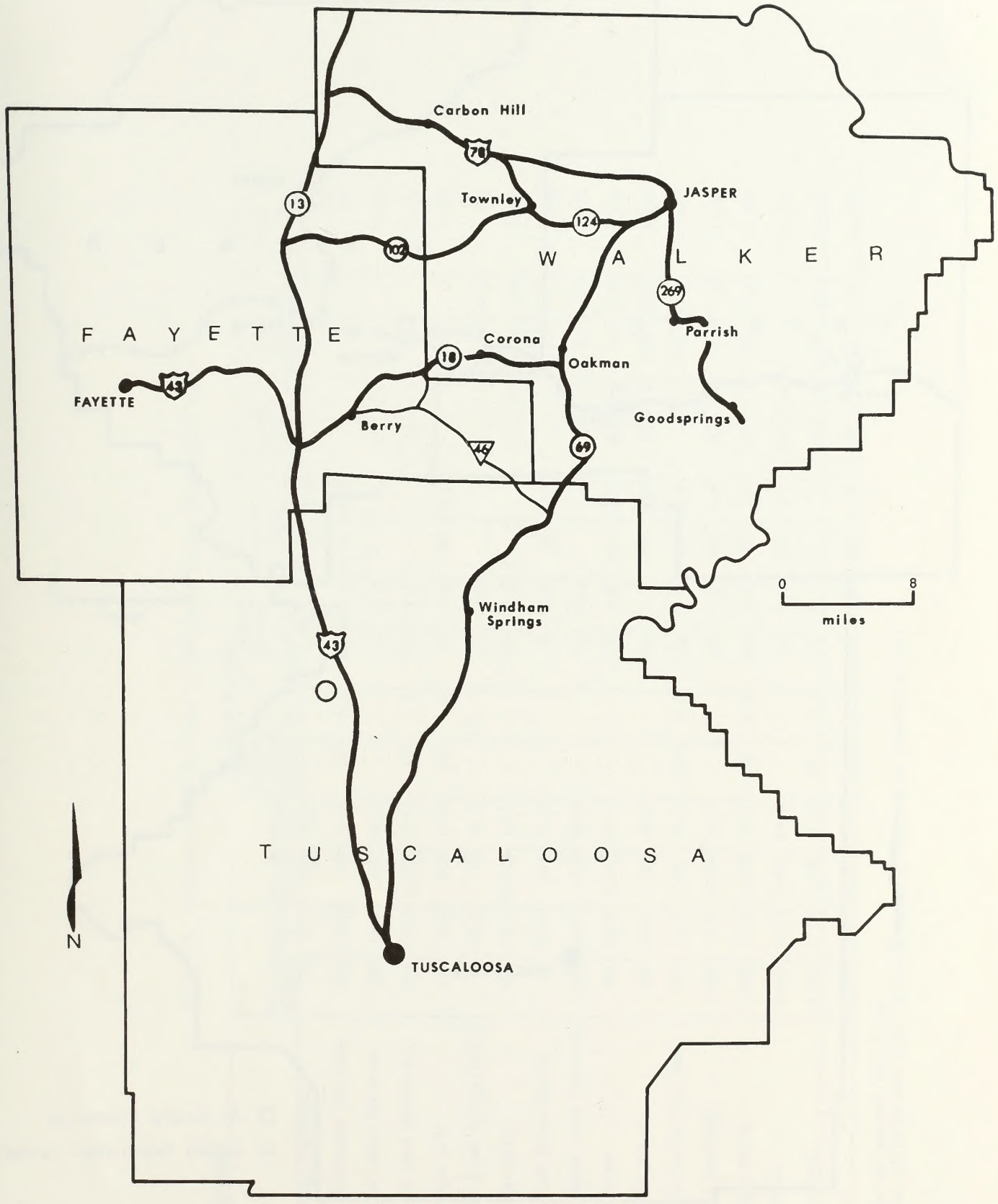


Figure 3-2. Major State and County Roads.

Figure 3-3. Southern Railroad Company Unit Coal Train Routes.

Table 3-2. Existing Vegetative Types in Delineated Tracts As of April 1982

Tract Name	Vegetative Type														
	Pine Forest		Mixed Forest		Upland Hardwood Forest		Riparian Systems		Disturbed Lands		Cleared Lands		Clear Cuts		Total**
	Acres*	%	Acres*	%	Acres*	%	Acres*	%	Acres*	%	Acres*	%	Acres*	%	
Pendley (Revised)	40	6.3	520	81.2			20	3.1	60	9.4					640
Willis Chapel (Revised)	190	39.6	160	33.3	15	3.1	55	11.5	60	12.5					480
Bagwell Road (Revised)	120	12.0	840	84.0			15	1.5			25	2.5			1,000
Crabbe Road (Revised)	165	10.9	1,280	84.2	20	1.3	25	1.6			30	2.0			1,520
Lockhart Hill	125	14.9	400	47.6	70	8.3	25	3.0	220	26.2					840
Boxes Creek By-Pass(Rev.)	40	22.2	60	33.3			25	13.9			25	13.9	30	16.7	180
Spencer Hill	480	14.6	2,330	71.1			105	3.2			115	3.5	250	7.6	3,280
Pleasant Grove Church	140	16.7	670	79.7			5	0.6	25	3.0					840
Watermelon Road (Revised)	1,110	67.7	410	25.0			50	3.0					70	4.3	1,640
Jock Creek	285	15.2	1,075	57.1			45	2.4	250	13.3	190	10.1	35	1.9	1,880
Panther Branch	260	21.0	360	29.0			90	7.3	250	20.2	50	4.0	230	18.5	1,240
Poplar Hollow (Revised)	460	16.7	1,255	45.5	220	8.0	50	1.8	440	15.9			335	12.1	2,760
Wiley (Revised)	1,325	9.8	9,980	73.8			505	3.7	590	4.4	390	2.9	730	5.4	13,520
Cripple Creek	1,985	13.3	10,510	70.7	35	0.2	360	2.4	190	1.3	425	2.9	1,375	9.2	14,880
Sandtown	2,235	17.5	8,920	69.9			175	1.4	470	3.7	960	7.5			12,760
Blue Creek	1,965	17.1	7,800	67.7	360	3.1	195	1.7			190	1.6	1,010	8.8	11,520
Total	10,975	15.84	46,570	67.51	720	1.04	1,745	2.53	2,555	3.70	2,400	3.48	4,065	5.90	68,980

* To the nearest five acres
** May disagree with tract delineation report because of rounding errors

Table 3-6. Land Use Controls in the 3-County Area

County/ Community	Adopted or Endorsed Land Use Plan	Zoning*	Subdivision Regulations	Building Codes
Fayette**	Yes (1972)	No	No	No
Berry	Yes (1977)	No	No	Yes
Fayette	Yes (1975)	Yes	Yes	Yes
Tuscaloosa**	Yes (1977)	No	No	No
Northport	Yes (1977)	Yes	Yes	Yes
Tuscaloosa	Yes (1977)	Yes	Yes	Yes
Walker**	Yes (1973)	No	No	No
Carbon Hill	Yes (1974)	No	No	Yes
Jasper	Yes (1973)	Yes	Yes	Yes
Oakman	Yes (1979)	No	No	No

* Counties require special enabling legislation to enact such land use controls.

** Counties also are addressed in Regional Land Use Plans (Birmingham Regional Planning Commission, 1977, and West Alabama Planning and Development Council, 1976).
Source: Birmingham Regional Planning Commission, West Alabama Planning and Development Council.

Table 3-7. Percentage of Minable Area Within the Tracts Rated Good, Fair, or Poor Soils

Tract Name	Good Soils	Fair Soils	Poor Soils
Underground			
Blue Creek	The undergound percentages cannot be precisely addressed until after a lease sale and mine plan submission. Only then can the locations and impacts of related surface effects be indentified.		
Cripple Creek			
Sandtown			
Wiley			
Surface			
Revised Bagwell Road	11	--	89
Spencer Hill	--	9	91
Watermelon Road	--	100	--
Poplar Hollow	25	26	49
Revised Crabbe Road	6	11	83
Revised Willis Chapel	--	--	100
Revised Pendley	--	6	94
Lockhart Hill	--	--	100
Panther Branch	--	75	25
Revised Boxes Creek By-Pass	1	2	97
Pleasant Grove Church	--	5	95
Jock Creek	--	99	1

Good, fair, or poor soils is an interpretive use rating adapted from the Soil Conservation Service for each of the soil mapping units present in the tracts. Good, fair, or poor, refers to the suitability of each soil class for cultivated crops, pasture, woodland, wildlife, and water capacity.

Table 3-8. Total Number of Known Cultural Resource Properties Recorded Within Proposed Tract Boundaries

Site Number	Resource Category	Description	Cultural Affiliation	Tract Name(s)
Tuscaloosa Co.				
1Tu354	M	Prehistoric lithic scatter/Chimney ruin	Aboriginal/Late 19th to Early 20th Century American	Spencer Hill/Blue Creek
1Tu355	H	Historic substructure/Chimney ruin	Late 19th to Mid 20th Century American	Blue Creek
1Tu356	P	Isolated lithic artifact	Aboriginal	(R)Wiley/Cripple Creek
1Tu357	H	Remains of whiskey still	Mid 20th Century American	Spencer Hill/Blue Creek
1Tu359	M	Prehistoric lithic scatter/Historic domestic debris	Aboriginal (Archaic)/Early to Mid 20th Century American	Blue Creek
1Tu360	P	Isolated lithic artifact	Aboriginal	Blue Creek
1Tu361	H	Chimney ruin	Late 19th to Mid 20th Century American	(R)Wiley/Cripple Creek
1Tu362	H	Chimney ruin	Early to Mid 20th Century American	(R)Wiley/Cripple Creek
1Tu363	H	Historic house site, domestic debris	Late 19th to Mid 20th Century American	Jock Creek/Blue Creek
1Tu365	H	Historic substructure	Early to Mid 20th Century American	Sandtown/Cripple Creek
1Tu366	P	Prehistoric lithic scatter	Aboriginal (Archaic)	Sandtown/Cripple Creek
1Tu368	P	Isolated lithic artifact	Aboriginal	(R)Wiley/Cripple Creek
1Tu371	P	Isolated lithic artifacts	Aboriginal (Archaic)	Sandtown
1Tu373	M	1 prehistoric lithic artifact/1 historic sherd	Aboriginal/Early to Mid 20th Century American	Sandtown
1Tu375	P	Isolated lithic artifact	Aboriginal (Archaic)	Sandtown
1Tu377	F	Frame dogtrot house, third generation	Early 20th Century American (ca. 1910)	(R)Wiley/Cripple Creek/ Crabbe Road

Table 3-8. Total Number of Known Cultural Resource Properties Recorded Within Proposed Tract Boundaries (continued)

Site Number	Resource Category	Description	Cultural Affiliation	Tract Name(s)
1Tu378*	F	Log and frame dogtrot house	Late 19th Century American (ca. 1875)	(R)Poplar Hollow/Sandtown
1Tu395	H	Historic substructure/Chimney ruin	Late 19th to Early 20th Century American	Sandtown/Cripple Creek
1Tu408	H	Chimney ruin	19th Century American	(R)Poplar Hollow/Sandtown/ Cripple Creek
Fayette Co.				
1Fa13	H	Historic substructure/Chimney ruin	Late 19th to Early 20th Century American	Sandtown
1Fa15	P	Isolated lithic artifacts	Aboriginal	Sandtown
1Fa21	M	Isolated lithic artifacts/Historic ceramics	Aboriginal/Early 20th Century American	Sandtown
1Fa37	H	Historic substructure/Chimney ruin	Early to Mid 20th Century American	Sandtown
1Fa40	P	Isolated lithic artifact	Aboriginal	Sandtown
1Fa58	H	Historic bricks/ceramics	Early to Mid 2oth Century American	(R)Boxes Creek Bypass
1Fa59	H	Chimney ruin/Historic ceramics	Early to Mid 20th Century American	(R)Boxes Creek Bypass
1Fa62	H	Chimney ruin/Historic ceramics	Early 20th Century American	Pleasant Grove Church
1Fa63	H	Chimney ruin	Early to Mid 20th Century American	Pleasant Grove Church
1Fa64	H	Chimney ruin/Historic ceramics	Early to Mid 20th Century American	Pleasant Grove Church

*Not on FMO Abbreviations: P=Prehistoric; H=Historic; M=Multi-component; F=Standing Folk House.

Sources: (Moorehead, Coblentz and Gillespie, 1978)
(Mistovich, Herbert and Willingham, 1982)

(see site-specific analyses)

Table 3-9. Tract by Tract Occurrence of Known Cultural Resource Properties

Site Number	(R)Pend-ley	(R)Willis Chapel	Lockhart Hill	(R)Boxes Cr. Bypass	Pleasant Gr. Church	(R)Crabbe Road	(R)Bagwell Road	(R)Poplar Hollow	Jock Cr.	(R)Water-melon Rd.	Panther Branch	Spencer Hill	Sand-town	(R)Wiley	Cripple Creek	Blue Creek
1Tu354* (M)												X				X
1Tu355 (H)																X
1Tu356 (P)														X	X	
1Tu357 (H)												X				X
1Tu359 (M)																X
1Tu360 (P)																X
1Tu361 (H)														X	X	
1Tu362 (H)														X	X	
1Tu363 (H)									X							X
1Tu365 (H)													X		X	
1Tu366 (P)													X		X	
1Tu368 (P)														X	X	
1Tu371 (P)													X			
1Tu373 (M)													X			
1Tu375 (P)													X			
1Tu377 (F)						X								X	X	
1Tu378**(F)								X					X			
1Tu395 (H)													X		X	
1Tu408* (H)								X					X		X	
1Fa13 (H)													X			
1Fa15 (P)													X			
1Fa21 (M)													X			
1Fa37 (H)													X			
1Fa40 (P)													X			
1Fa58 (H)				X												
1Fa59* (H)				X												
1Fa62 (H)					X											
1Fa63 (H)					X											
1Fa64* (H)					X											

Abbreviations: P=Prehistoric; H=Historic; M=Multicomponent; F=Standing Folk House

NOTE: Several tracts overlap, therefore causing some duplication of cultural resource properties listed above.

* Located within "surface mineable" areas
** Not over FMO

Sources: (Moorehead, Coblentz and Gillespie, 1978)
(Mistovich, Herbert and Willingham, 1982)

(see site-specific analyses)

Table 3-10. Visual Resource Summary for All Potential Second Round Coal Lease Tracts

Surface Tracts	Scenery Unit	Prevailing Vegetation	Scenic Quality	Visual Sensitivity	Distance Zone	VRM Class
Revised Pendley	Mountain & Valley	Pine & Decid. Mixed Forest	B	High to Medium	Foreground/ Middleground Seldom Seen	III/IV
Willis Chapel	Mountain & Valley	Pine & Decid. Mixed Forest	B	Medium	Seldom Seen	IV
Lockhart Hill	Mountain & Valley	Pine & Decid. Mixed Forest	B	Medium	Background Seldom Seen	IV
(R) Boxes Cr. Bypass	Rolling Uplands	Pine & Decid. Mixed Forest	C	Medium	Foreground/ Middleground Background Seldom Seen	IV
Pleasant Grove Ch.	Rolling Uplands	Pine & Decid. Mixed Forest	C	Medium	Background Seldom Seen	IV
(R) Crabbe Road	Rolling Uplands	Pine & Decid. Mixed Forest	C	Medium to Low	Seldom Seen	IV/V
(R) Bagwell Road	Rolling Uplands	Pine & Decid. Mixed Forest	C	Low	Seldom Seen	IV
Poplar Hollow	Plateau/ Rolling Uplands	Pine & Decid. Mixed Forest	C	Medium to Low	Foreground/ Middleground Seldom Seen	IV
Jock Creek	Mountain	Pine & Decid. Mixed Forest	B	Medium	Seldom Seen	IV
Watermelon Road	Rolling Uplands	Pine & Decid. Mixed Forest	C	Low	Seldom Seen	IV
Panther Br.	Black Warrior Escarp-ment	Pine & Decid. Mixed Forest	B & C	High to Medium to Low	Seldom Seen	IV
Spencer Hill	Mountain/ Black Warrior Escarp-ment	Pine & Decid. Mixed Forest	B	High to Medium	Seldom Seen	IV

Table 3-10. Visual Resource Summary for All Potential Second Round Coal Lease Tracts (continued).

Underground Tracts	Scenery Unit	Prevailing Vegetation	Scenic Quality	Visual Sensitivity	Distance Zone	VRM Class
Sandtown	Plateau/ Rolling Uplands	Pine & Decid. Mixed Forest	B & C	High to Medium to Low	Foreground/ Middleground Background Seldom Seen	III/IV
Wiley Revised	Broadland/ Rolling Uplands	Pine & Decid. Mixed Forest	C	Medium to Low	Foreground/ Middleground Background Seldom Seen	IV/V
Cripple Cr.	Plateau/ Rolling Uplands	Pine & Decid. Mixed Forest	C	Medium to Low	Foreground/ Middleground Background Seldom Seen	IV/V
Blue Creek	Mountain/ Black Warrior Escarp-ment/ Rolling Uplands	Pine & Decid. Mixed Forest	B & C	High to Medium to Low	Seldom Seen	IV

Source: "Visual Inventory and Evaluation of the North Central Alabama Planning Area," Claude Terry and Associates, Inc. (prepared for the BLM, Tuscaloosa Office), May 1978.

Table 3-11. Welfare Recipient Data
Cases Receiving Financial Assistance Through
County Departments of Pensions and Security

County	Cases Receiving Financial Assistance - November, 1982				
	Total	Old Age Pensions	Aid to Blind	Aid to Permanently and Totally Disabled	Aid to Dependent Children Families
Fayette	293	94	0	33	166
Jefferson	12,252	995	23	438	10,796
Tuscaloosa	2,560	327	1	128	2,104
Walker	1,047	235	5	157	650
Regional Total	16,152	1,651	29	756	13,716

Source: State of Alabama, Office of State Planning and Federal Programs, Montgomery, Alabama, 1983.

Table 3-12. Municipal Revenue by Source - 1977

County Community	Source of Revenue							
	Local Revenue					State Shared Revenues	Federal Shared Revenues	Total Revenues
	Sales Tax	Property Tax	Gasoline Tax	Occupational Tax	Total			
Berry	NA	NA	NA	NA	NA	NA	NA	NA
Fayette	288	73	44	-0-	682	104	184	900
Birmingham	12,116	4,780	1,879	15,428	54,300	5,338	10,400	7,040
Northport	361	188	78	-0-	1,408	80	265	1,754
Tuscaloosa	2,346	1,160	437	-0-	8,838	556	1,770	11,165
Carbon Hill	NA	NA	NA	NA	NA	NA	NA	NA
Jasper	1,686	204	127	-0-	2,626	129	631	3,387
Oakman	NA	NA	NA	NA	NA	NA	NA	NA

NA: Not Available
Source: Alabama League of Municipalities, July 1978

CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

This chapter contains the results of the analysis of environmental consequences of the various leasing alternatives. This analysis was conducted in a manner addressing the "worst case" condition for the portions of the tract projected to be mined. Exceptions to this include hydrology and other resources where impacts are not limited to acreage mined.

Discussions of impacts and mitigating measures were developed through the application of the appropriate Federal and state laws and regulations governing a particular operation or resource. These include, but are not limited to, the Surface Mining Control and Reclamation Act of 1977 (SMCRA), the Federal Land Policy Management Act of 1977 (FLPMA), National Historic Preservation Act of 1966, Clean Air Act Amendments of 1977, Clean Water Act of 1977, Endangered Species Act of 1973, Fish and Wildlife Coordination Act of 1934, and appropriate state laws protecting specific resources.

AIR QUALITY

There will be no measurable regional impact on climate as a result of implementation of any of the alternatives. Fugitive dust is the only air pollutant which would be generated in large enough quantities to have a locally significant impact on air quality. This conclusion is based upon detailed site-specific and regional dispersion modeling and analysis of the Federal action alternatives by PEDCo Environmental, Incorporated, and Radian Corporation, under contract to the Bureau of Land Management (BLM). While there would be some generation of other pollutants, such as sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and nonmethane hydrocarbons, national and Alabama ambient air quality standards would not be exceeded. Pollution related to increased population as a result of Federal coal development would be so minor as to be unmeasurable on a regional scale for all alternatives.

The 1982 annual ambient PSD (prevention of significant air quality deterioration) concentrations average around 42 ug/m^3. In the most heavily impacted areas this is two ug/m^3 above background levels. This is 56 percent of the allowable Federal primary and state standard of 75 ug/m^3. Ambient total suspended particulates (TSP) concentrations outside the modeled area will increase from zero to less than 2 ug/m^3 above the existing background levels. Annual ambient TSP concentrations for 1982 averaged 42.5 ug/m^3 over approximately 10 percent of the area of significant air quality impacts. This is 57 percent of the allowable primary standard.

Air quality impacts predicted for 1990 and 1995 are similar to that of 1982. Ambient concentrations of particulates will increase slightly

to 42-45 ug/m^3 in the impacted area. During all the years of the study period (1982-1985), TSP concentrations within approximately one mile of both existing and proposed mines will increase. However, no violations of the annual ambient TSP standard will occur.

UNAVOIDABLE ADVERSE IMPACTS

There will be temporary, localized increases in TSP concentrations in and around the mine areas. A "worst case" scenario predicts a maximum of 140 ug/m^3 24-hour TSP concentration. Regional air quality and visibility impacts would be minimal and insignificant.

COMMITTED MITIGATION

OSM regulations (30 CFR, especially at 816.95 and 817.95) contain specific fugitive dust control measures required as an integral part of all site preparation, coal mining and reclamation operations. These may include the following, upon approval by the regulatory authority: periodic watering, chemical stabilization or paving of unpaved roads; removal of dust-forming debris from roads; restricting the speed of, or limiting vehicular access to, certain roads; and numerous other fugitive dust control and monitoring measures.

OTHER MITIGATING MEASURES

None necessary in addition to existing, required measures.

GEOLOGY AND MINERAL RESOURCES

No matter which alternative, including no action, is chosen, the major impact to geology and minerals would be the mining of the coal. Surface mining would disrupt the overlying rock. Underground mining would disrupt the rock proximate to the mined seam. This impact will occur regardless of whether there are new Federal leasing actions or not.

There exists some possibility of post-underground mining subsidence affecting other resources. However, this possibility probably is remote, because of the relative thinness of the mined seams and the depth of mining. Further detailed geologic studies probably will not yield the data needed to accurately predict either the occurrence or magnitude of any possible subsidence. Historical data related to subsidence in the area of Federal tracts is contained in chapter 3.

An undetermined amount of natural gas would be lost through underground mining of the Mary Lee seam. Other oil and gas reservoirs

probably would be unaffected by any type of mining. The only probable impact to the other reservoirs will be the delay of oil and gas exploration/development in the area of the mines for the duration of the mining.

For all alternatives, construction activities associated with mine development will require sand, gravel, and clay products. In fact, most clay production in the Subregion is a by-product of coal mining.

Due to the relative sparseness of the paleontologic resources, they would not be significantly affected by mining.

UNAVOIDABLE ADVERSE IMPACTS

Removal of the coal and associated disruption of the rocks would result from mining. This is a consequence of mining which will have no significant effect on the human environment.

IRREVERSIBLE/IRRETRIEVABLE COMMITMENT OF RESOURCES

The coal mined and consumed as well as the coal which is unrecoverable due to technological constraints, would not be available for future use. The amount of Federal recoverable coal that would be irretrievably committed by Federal actions would be (for the several alternatives, reflected in millions of tons) as follows:

Alternative One - 46.1 — This figure represents the results of earlier Federal leasing.

Alternative Two - 109

Alternative Three - 113

Alternative Four - 128.5

An additional, but undetermined, amount of Federal coal would be committed as a result of by-pass situations.

WATER RESOURCES

GROUND WATER

Effects to ground-water resources in the Black Warrior and Upper Tombigbee basins (fig. 4-1) that result from leasing and developing

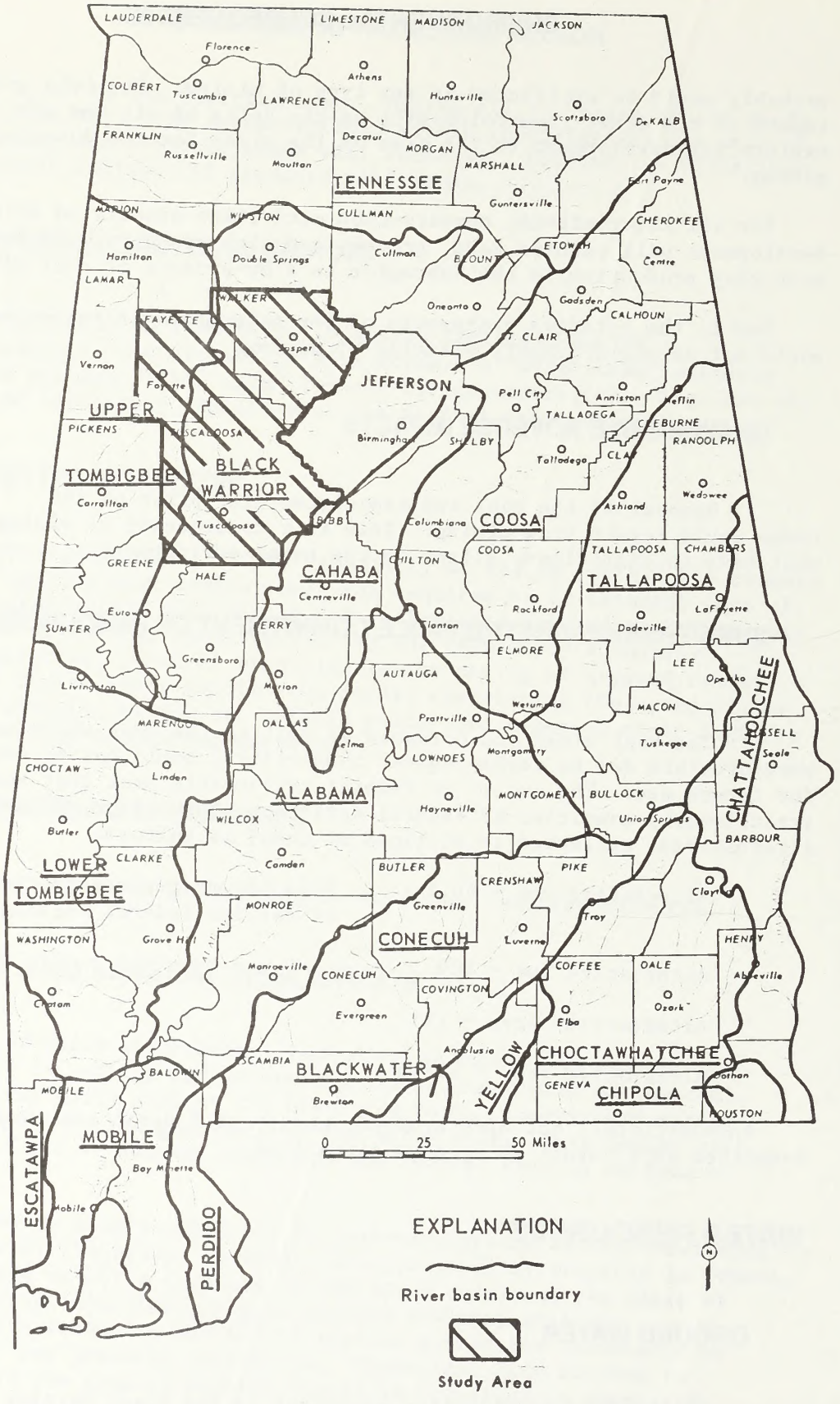


Figure 4-1. Counties and River Basins of Alabama (modified from Alabama Water Improvement Commission, 1976).

Federal coal will occur almost entirely in the vicinity of the mining operations and should have no significant effect on regional ground water systems. There will be significant localized effects, however. These stem largely from: 1) removal of parts of certain aquifers, 2) interruption of pre-mining ground-water movement by mining operations, 3) modification of ground-water movement and storage by spoil replacement in surface mines and possible waste rock accumulations resulting from subsurface mining, 4) changes in water quality caused by leaching of spoil, contact with fresh bedrock, and possible recharge from settling ponds and processing impoundments, and 5) impacts resulting from subsidence associated with underground mining.

a) Removal of Parts of Certain Aquifers

Mining Federal coal will result in the removal of parts of certain aquifers within the mined area with increased ground-water mineralization, general dewatering of wells and/or smaller available yields.

The approximate extent of potential aquifer removal or disturbance that will result from the implementation of different alternatives is given in table 4-1.

Data are not available to approximate the effects of past and current mining on ground water supplies. Available data do show that the effects are local in nature and occur in the general vicinity of mining operations. The estimated number of wells that will be destroyed by the removal of aquifers, or otherwise impaired by mining operations, is given for alternative levels of mining in table 4-2. New wells can be placed on the post-mining surface, but may be several hundred feet deeper, have a greater pumping lift, and should be cased to a depth exceeding that of aquifers prone to recharge from the mine.

b) Interruption of Premining Ground-Water Flow

The intersection of surface mining with water-bearing openings results in a draining of the openings and a corresponding decline in water level adjacent to the mine. Where the openings intersected by the mine are tapped by nearby wells, the decline can result in a dewatering of the wells or in smaller available yields. The declines can be short-term (recovering or partially recovering after mining), or permanent (Knight and Newton, 1977). The declines, generally, are restricted to the immediate vicinity of the mines and their magnitude decreases with distance from the mine. The maximum possible decline at a particular site cannot be determined prior to mining, but would be less than the difference between the altitude of the mine floor and that of the pre-mining water level. Should any nearby domestic or stockwater wells be significantly affected, the responsible mining company must replace the interrupted supplies (30 CFR 816.54 and 817.54).

Changes in ground-water flow also result from subsidence associated with underground mining where fractures extend to the land surface or

into overlying aquifers tapped by wells. This problem could affect wells and springs, and, if fractures occurred in stream floors, could result in some diversion of surface water into the subsurface. This problem, if it occurs, is expected to be localized because of the depth of most of the delineated subsurface tracts and the presence of competent strata at shallower depths. The impact of subsidence on shallow aquifers, if it occurs, also is expected to be minimal. Declines in water levels would be localized because of the limited permeability of the affected aquifers. Possible effects of subsidence on surface water are discussed in the Surface Water portion of this chapter.

c) Modification of Ground-Water Flow by Mining

Water in the Pottsville Formation occurs in bedding planes, fractures, joints, and faults in relatively impermeable, indurated rocks. These are usually poor aquifers with low storage capacities and permeabilities. Removal of the relatively impermeable, indurated overburden and replacement of the mined interval with broken rock spoil materials will generally increase the storage capacities and permeabilities of the mined areas.

In lowland areas, mining may intersect the water table and cause a temporary lowering of the water table. An eventual recovery of the water table should occur after the mined area is reclaimed.

Modification of ground-water flow by underground mining will occur as the mine intersects water-bearing faults or joints. If the water-bearing openings extend to overlying aquifers, a local decline in their water levels will occur.

d) Changes in Water Quality

Significant degradation of local ground water quality is expected to occur where mined areas become a source of recharge to underlying aquifers. Water in the aquifer becomes similar in character to that of mine drainage. Like mine drainage, it may be acidic or alkaline depending on the chemistry of the rock disturbed. With time, water in the receiving aquifer becomes progressively more mineralized. Hardness and dissolved solids and sulfate contents increase, and significant increases in iron, aluminum, and manganese may also occur.

Changes in ground-water quality caused by surface mining will be similar to those described in the Surface Water section. Tables 4-3, 4-4, 4-5, and 4-6 show the changes in surface water quality at the various alternative levels. Wells susceptible to increased mineralization are included in those given in table 4-1.

The approximate surface areal extent of potential aquifers that will be disturbed by mining Federal coal at different alternative levels is given in table 4-1. The area of ground water degradation will exceed this by some unknown amount.

Some local degradation in the quality of ground water in shallow aquifers will occur where they receive recharge from highly mineralized

water in waste rock accumulations resulting from subsurface mining. Recharge to aquifers from process water or mine effluent may also result in local degradation. All quality-of-water impacts resulting from surface and subsurface mining are long-term, but are restricted largely to the general vicinities of their source of recharge.

SURFACE WATER

Mining of Federal coal will affect surface water resources within delineated tracts and offsite in receiving streams. Impacts include: 1) changes in streamflow characteristics, 2) degradation of water quality, 3) increased erosion and sedimentation, and 4) potential effects of subsidence from underground mining on surface drainage.

a) Changes in Streamflow Characteristics

Permeable spoil aquifers created by mining will result in increases in low flow. Locally, some discharge will occur in reaches of streams during periods when they normally are dry (Puente and Newton, 1979). This impact will be local but long-term. Flood flow also may increase locally due to removal of vegetation. This occurrence will be short-term and insignificant.

b) Degradation of Water Quality

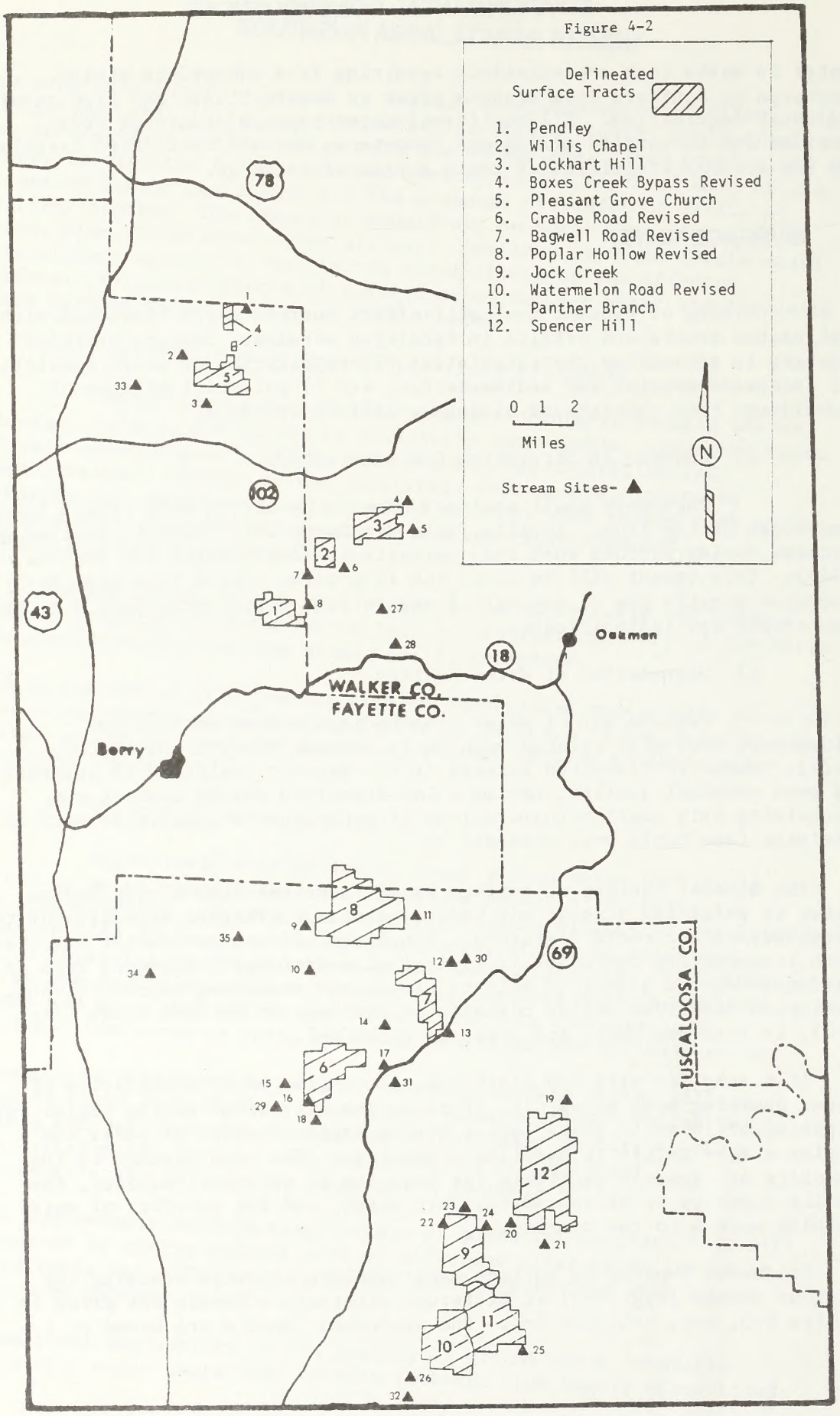
Degradation of water quality is the most serious and widespread coal-mine-related problem in Alabama (Knight and Newton, 1977). Water in disturbed streams in the Warrior Coalfield is generally of good chemical quality, having a low dissolved solids content and containing only small concentrations of constituents associated with mine drainage (see table D-1, appendix D).

The mineral content of surface water increases when mining begins. Water in receiving streams may become acidic or alkaline depending on the chemistry of the rocks disturbed. The dissolved solids content increases with accompanying increases in typical mine drainage indicators such as hardness and the dissolved sulfate, iron, and manganese concentrations. Estimated dissolved solids contents in drainage at various sites (fig. 4-2), in tons per year, are given in table 4-7.

At a specific site and discharge, the degree of mineralization of water draining most mines will increase steadily after mining begins for a period of 10 to 12 years (after mining begins) before it peaks and begins a slow return to baseline conditions. The time depends on the quantity of minerals available for leaching in the spoil aquifer, the spoils capacity to store and transmit water, and the quantity of water gaining access to the minerals.

Projected impacts on surface water quality at sites draining the various tracts (fig. 4-2) at different alternative levels are given in tables 4-3, 4-4, 4-5, and 4-6. The projected impacts are based on a

Figure 4-2


Delineated
Surface Tracts
1. Pendley
2. Willis Chapel
3. Lockhart Hill
4. Boxes Creek Bypass Revised
5. Pleasant Grove Church
6. Crabbe Road Revised
7. Bagwell Road Revised
8. Poplar Hollow Revised
9. Jock Creek
10. Watermelon Road Revised
11. Panther Branch
12. Spencer Hill
0 1 2
Miles
Stream Sites-
N
78
102
43
18
69
Oakman
Berry
WALKER CO.
FAYETTE CO.
TUSCALOOSA CO.

selected low flow (0.1 cfs/mi^2) and a near average discharge (1.5 cfs/mi^2). These discharges were selected for comparative purposes only. Methods utilized to make the projections are described in appendix A.

During mining, the impact of individual tracts on receiving streams will be minimal and local with respect to their state water use classification. This is due to the onsite mitigation of iron, manganese, and pH during mining.

The impact of the mine drainage, decreasing with distance from the mines, will dissipate immediately upon entering the Black Warrior or Sipsey Rivers. The impact on the major streams, in relation to their stream classifications, will be restricted largely to the point of inflow and will be insignificant regionally.

The greatest impact resulting from surface mining of Federal coal, based on available information, will occur in subbasins during low or near zero flow after mining, and after mitigation (of pH, iron and manganese) ceases.

Unfortunately, data on which projections (tables 4-3, 4-4, 4-5, and 4-6) and conclusions are based represent impacts from mining and reclamation performed under less stringent regulations than those existing in 1980. The impact of spoil aquifers on receiving streams should be mitigated to some degree by new OSM regulations.

Impacts on the degradation of surface water quality, resulting from underground mining, will be long-term but localized. Sources of mineralization will be mine effluent, processing effluent, settling ponds, and water coming into contact with waste rock accumulations. Any effluent discharging into streams will impact the natural quality to some degree. Impacts resulting from subsurface mining on surface water quality are considered here to be mitigated because permitting and regulatory agencies (Alabama Department of Environmental Management (ADEM) and Office of Surface Mining (OSM)) will have access to the needed information and will permit, monitor, and regulate the subject mines to assure minimal impacts.

c) Impacts on Lake Tuscaloosa

City of Tuscaloosa officials have expressed concern regarding possible future hydrologic impacts on Lake Tuscaloosa, a public water supply reservoir. These expressions are addressed in appendix B, where required mitigative measures, present water quality conditions, and future hydrologic impacts to the reservoir are discussed. Without preventive measures, water quality problems related to sedimentation are those of decreased reservoir storage capacity, degradation of aquatic habitat, and reduction of aesthetic qualtiy. Impacts to municipal reservoirs, however, that would result from the mining of Federal coal would be minimal due to mitigating measures. These measures are intended to keep sediment yields in mined areas within the expected range for unmined areas for each leasing alternative.

d) Potential Effects of Subsidence from Underground Mining

Subsidence of sufficient severity to impact surface water resources is not expected to result from underground mining of Federal coal because the depth of mines and the presence of overlying competent strata. However, if fractures extend to the surface depletion of streamflow and reservoir storage could occur.

e) Erosion and Sedimentation

Required mitigative measures will limit erosion and resulting sediment transport to short-term impacts of a local nature. Most impacts of significance will be on-site.

Present mitigating procedures require that all on-site runoff from areas disturbed by surface activities associated with surface or undergound mining must not transport off-site more than 35 mg/l of total suspended solids as an average of daily values for 30 consecutive discharge days (30 CFR 816.42 and 817.42). These mitigating measures, based on USGS records for basins in the Warrior Coalfield, may result in sediment yields that are smaller than those currently emanating from some unmined subbasins.

UNAVOIDABLE ADVERSE IMPACTS

Mining will cause: removal of parts of certain aquifers, interruption of pre-mining ground-water flow by replaced spoil aquifers, changes in surface and ground-water quality by leaching of spoils materials, alteration of existing surface drainage, and an increased consumptive use of water.

SHORT-TERM VS LONG-TERM

The short-term use of the land for development of Federal coal would create a number of long-term impacts on local water resources.

a) Ground Water

At the preferred alternative level of development, about 50,105 surface acres of aquifers will be disturbed and about 338 wells will be impacted or destroyed by surface mining. Aquifers removed by surface mining would be replaced by spoil materials that would have different hydrologic characteristics than the original aquifers. Such characteristics include increased storage and transmittal of water from spoil aquifers than the original aquifers. The 40,160 acres of aquifers removed by underground mining would not be replaced. Increased mineralization of ground water will occur near the mined area.

Subsidence and/or fracturing of overlying rocks from underground mining could drain aquifers in the immediate vicinity of the mines. All impacts to ground water should be local and should have no regional significance.

b) Surface Water

The degree of mineralization of water draining from most surface mines, at a given site and discharge, will increase progressively and peak in 10 to 12 years after mining begins before beginning a slow return to baseline conditions. Expected ranges in constituent concentrations are 100-3,000 umhos for specific conductance, 2.5-8.8 units for pH, 15-1,800 mg/L for sulfate, and 60-2,000 mg/L for dissolved solids (Puente and others, 1982). The most significant potential impact can occur in subbasins during low or near zero flow following mining and after the required mitigation of pH and the iron and manganese contents has ceased. Aquatic communities could be significantly impacted if iron or manganese contents are high. Any impact to Lake Tuscaloosa under the preferred alternative, because of its inflow and volume, would be restricted to the point of inflow. Impacts on base flow will be local and long-term and, after the accompanying impact on water quality dissipates, will be positive in terms of increased recharge and base flow to nearby streams which will reduce the concentrations of dissolved minerals.

IRREVERSIBLE/IRRETRIEVABLE COMMITMENT OF RESOURCES

Aquifer removal and associated disturbances in mined areas would, under the preferred alternative, permanently change conditions of ground-water occurrence in about 50,105 acres of surface mined land and 40,160 acres of subsurface mined land. This would be a localized impact. An insignificant amount of surface water used in mining operations would be lost by evaporation.

COMMITTED MITIGATION

Federal regulations require stabilization of disturbed land to minimize sediment yield, construction of impoundment ponds to appropriate standards, minimization of adverse impacts on water quantity and quality, and construction of roads to minimize sediment yield (30 CFR 211.4(e), 211.40(a) 3, 5, 7, and 11, and 43 CFR 3041.2-2(f) 3, 5, 7, and 11).

All surface water withdrawals and discharges are permitted and monitored by the Alabama Water Improvement Commission. The Alabama Surface Mining Commission (ASMC) requires a hydrological report on the proposed mine area and hydrological monitoring of the mine site area.

7) Uncommitted Mitigation

Augmentation of low flow by ground water or surface storage facilities in mined streams with high mineralization would reduce the predicted impacts. Careful analysis is necessary to determine whether the benefits of such augmentation would outweigh their impacts on the environment.

VEGETATION

Short-term impacts from surface mining include removal of all vegetation during mining and reclamation operations. There should be no net acceleration of vegetative loss after the first year of mining with regard to overall acreage affected because of contemporaneous reclamation. Specific net loss of vegetation types such as riparian systems may occur, however. In many areas established vegetation will be replaced with new, and often different, vegetative types during reclamation. Short-term impacts from underground mining include vegetation removal for power lines, coal conveyor belts, and waste rock disposal areas.

Long-term impacts to vegetation from surface mining include a reduction in plant species diversity, a possible increase in plant productivity, and a significant increase in monocultural, post-mine land use. Table 4-8 shows the cumulative acreage disturbed by forest type for each alternative. There is no significant increase in land disturbed when each alternative is compared to baseline conditions.

The long-term impact to vegetation from deep mining is vegetation removed for mine support facilities for the life of the mine.

Expected loss of riparian habitat from surface disturbance is expected to be minimal since the major mining method, block-cut contour, is not expected to intersect low-lying stream bottoms. Additionally, the State Regulatory Authority may protect stream buffer zones and stream channels; or, if mining through these areas is approved, the operator is required to follow specific reclamation and protection provisions, including the restoration of the riparian vegetation and stream conditions. (See Alabama Regulations 816.57, 816.44(d). Table 4-9 shows the vegetation types on surface minable acres on a tract-by-tract basis.

Table 4-8. Total Acres of Vegetation/Wildlife Habitat Removed by Vegetative Type and Leasing Alternative in the Alabama Subregion[1]

Vegetation Type	Alternative			
	Alternative One (no action) (Baseline)	Alternative Two	Alternative Three (Preferred)	Alternative Four (All Tracts)
Pine Forest	30,560	635	1,765	1,765
Mixed Forest	59,710	1,075	3,050	3,050
Upland Hardwood Forest	6,090	5	75	75
Riparian Ecosystems	6,360	25	45	45
Disturbed Forest	180	--	20	20
Cleared Lands (Agr)	7,190	15	25	25
Clear Cuts	11,910	--	410	410
Unknown (Underground Tracts)	1,000	1,050	1,050	1,400
Total	123,000	2,805	6,440	6,790
Cumulative	123,000	125,805	129,440	129,790

[1] Assumed types disturbed from the no action alternative are in the same approximate proportions to Alternative Four.
Source: Base figures derived from 1:24,000 aerial photo analyses.

UNAVOIDABLE ADVERSE IMPACTS

There will be a loss of vegetation and vegetative productivity preceding and during mining, and probable reduction in species diversity after reclamation.

COMMITTED MITIGATION

Vegetation must be reestablished as prescribed by the State and Federal Regulatory Authorities.

OTHER MITIGATING MEASURES

Riparian ecosystems are of high value to wildlife and are of national significance because of regional decline in wetland acreages. Because of

the national and regional decline of fragile riparian ecosystems and their documented "high" value to many species of fish and wildife and as stream buffer zones, the Regulatory Authority for mine-permit approval and the landowner are encoruaged to select a postmining land use that includes the application of the "Best Technology Currently Available" to reestablish riparian ecosystems of similar or equal value and function.

SHORT-TERM VS LONG-TERM

Committed mitigation should ensure that vegetation is replaced after mining. Long-term productivity will be the same or will be enhanced, if the areas mined are reclaimed properly.

WILDLIFE

This section was discussed in detail on pages 91-92 of the first round EIS and generally remains unchanged. In summary, loss of vegetation will affect wildlife through destruction of food sources and cover. Mobile species will utilize habitable adjacent areas, where over-utilization of food sources, and subsequent reduction in potential wildlife productivity, is likely to occur. Wildlife that are not mobile will perish. Refer to table 4-8 for estimates of total acres by habitat type disturbed for each leasing alternative.

Potential effects of surface mining on aquatic environments include a decrease in habitat diversity and in the number of nongame species which occur in intermittent streams having an average annual flow of 5 cfs or less. Factors affecting fish and benthic invertebrate communities include increased runoff, suspended sediment, siltation, and acid mine drainage.

Potentially significant local impacts of surface mining on FWS designated Species of Special Emphasis are both positive and negative. For example, any loss of riparian or bottomland forest habitat could negatively effect the wood duck, green heron, Bachman's warbler, and possibly the pileated woodpecker. The red-headed woodpecker could also be negatively affected by the loss of large trees which compromise its preferred habitat. These negative impacts are not regarded as regionally significant, as these habitats do not provide essential habitat requirements and are limited with respect to availability of food, wintering grounds, reproduction areas, or areal extent. Positive impacts from surface mining and reclamation include long-term benefits to populations of bird species that prefer continuous edge habitats and additional vegetative openings, including the mourning dove, Cooper's hawk, Bewicks's wren, eastern bluebird, and American woodcock.

No significant adverse impacts to currently federally-listed threatened or endangered species are expected to occur if any of the leasing alternatives are adopted. The flattened musk turtle, a Category

1 species to be proposed for threatened status, occurs in the Black Warrior River basin from Bankhead Dam northward within the Fayette, Tuscaloosa, and Walker County area. Habitat deterioration for this species, which has been attributed primarily to sedimentation from previous surface mining and agricultural activities, has necessitated a Category 1 (proposed threatened status) FWS designation for the turtle. A reinitiation of informal consultation upon submission of future mine plans should resolve any questions regarding impacts to this species near leased tracts.

Alteration and loss of riparian habitat, as compared with upland habitat, is of particular concern because of fish and wildlife values and lack of well-demonstrated technology for habitat reestablishment. Riparian habitat comprises only a small portion (less than one percent) within the impacted area, however, and such habitat near surface mining should be minimally affected since the major mining method, block-cut contour, will not intersect lower-elevation riparian zones.

UNCOMMITTED MITIGATION

Pre-mining clearing operations will cause the loss or displacement of animals now residing in those areas mined. There will be a long-term loss of those species adapted to mature forest habitat when those areas are mined.

COMMITTED MITIGATION

Alabama rgulation 780.18 (Reclamation Plan: General Requirements) includes a requirement [(a)(6)] to describe the steps to be taken to comply with the performance standard relating to fish and wildlife contained in Alabama regulation 816.97.

OTHER MITIGATING MEASURES

All surface activities should reasonably avoid impacts to riparian ecosystems.

Subsequent to leasing and prior to surface mining (or surface activities associated with an underground mine) areas should be surveyed for the endangered red-cockaded woodpecker.

SHORT-TERM VS LONG-TERM

For the short-term, all wildlife species will be removed from areas mined. Over the long-term, there may be no adverse wildlife

impacts to those species adapted to mature forest. Woodland species may be displaced for more than 50 years, depending on post-mining land use. Additionally, any loss of riparian or bottomalnd forest systems would be long term.

Alabama rgulation 780.18 (Reclamation Plan: General Requirements) includes a requirement [(a)(6)] to describe the steps to be taken to comply with the performance standard relating to fish and wildlife contained in Alabama regulation 816.97.

LAND USE

Under Alternative One, approximately 123,000 cumulative acres would be disturbed by the Year 1995. This is not considered to be a significant percentage of the land in the EIS region. Alternative Two would account for the disturbance of an additional 2,954 acres, or .16 percent of the 3-county area. Alternative Three would account for the disturbance of approximately 6,384 acres, or approximately .36 percent of the 3-county area. Approximately 6,784 acres will be disturbed under Alternative Four. This represents approximately .38 percent of the county area.

The BLM does not control any of the surface overlying the Federal coal that is proposed for leasing; therefore, it is not possible to dictate the post-mining land use. The post-mining land use will be determined upon approval of the resource recovery and protection plan by OSM (30 CFR 784.15).

It is probable that most of the land will be returned to its pre-mining use, i.e., predominantly forest. However, if the original contour requirement is waived in steep slope areas, the land may be reclaimed to a higher use (30 CFR 785.16). One option available will be reclaiming the land to pasture or cropland.

Projections indicate that population increases, directly attributable to the proposed mining, will be approximately 100 persons at the maximum by the Year 1995. This increase is not expected to have a significant impact on land use in the region.

Utility rights-of-way should not be impacted to a significant degree by either surface or underground mining. During the LUA, utility rights-of-way were excluded from further consideration for mining. However, a gas pipeline corridor crosses the Blue Creek underground tract and the Jock Creek and Panther Branch surface tracts. Subsidence or blasting operations could disturb this pipeline. ASMC will mediate any problems with the mining operators and the gas company.

LAND OWNERSHIP

The Federal Government does not own or control any of the surface over Federal coal that is proposed for leasing. Other than normal

transactions and conveyances between consenting private parties, there will be no impact on land ownership.

SURFACE OWNER CONSIDERATIONS

Section 714 of the Surface Mining Control and Reclamation Act (SMCRA) defines surface owners and the protections offered to qualified surface owners. Other Federal and state laws and contractual arrangements provide recourse to surface owners who believe themselves to be adversely affected.

To the maximum extent possible, surface owners' opinions were considered during tract delineation and ranking. However, two surface owners of lands over FMO within delineated tracts have submitted Statements of Refusal to Consent to surface mining of their lands. The two surface owners are considered nonqualified as defined in section 714 of SMCRA. The total minable acreage involved is approximately 54 acres. These two refusals involve three delineated tracts. Surface owner consent is not required for underground mining.

SOILS

Loss of some topsoil is inevitable during handling; also, some topsoil loss will occur as a result of erosion. OSM regulations (30 CFR 816.114 and 826.12), requiring soil stablilization by soil treatment and grading, are expected to lessen these soil loss impacts.

Revegetation of the reclaimed mined areas will be carried out as specified in 30 CFR 816.116 or 817.116. Tree and shrub stocking for forest land will comply with 30 CFR 816.117 or 817.117.

Under Alternative One, the acres disturbed are only those acres associated with previously-leased tracts (see table 4-10). The rest of the alternatives deal with the new delineated tracts.

Alternative Two represents those tracts with only a high ranking: one acre of good soil disturbed, 1,209 acres of fair soils, and 544 acres of poor soils. Alternative Three has incorporated the acreages of two: 263 acres of good soils disturbed, 2,131 acres of fair soils, and 2,790 acres of poor soils. Alternative Four shows no change in acres disturbed from Alternative Three. This is a result of a lack of surface disturbance data for the underground mining operations. The only way of gaining this information is through the submission of a resource recovery and protection plan.

Table 4-10. Cumulative Acres Disturbed[1] by Surface Mining to the Year 1995

Alternative	Acres Disturbed[2]			Cumulative
	Good	Fair	Poor	
1. No Action (previsously leased Federal tracts)	1979	2616	165	4760
2. All High Ranked	1	1209	544	1754
3. All Surface and High Ranked Underground	263	2131	2790	5184
4. All Tracts	263	2131	2790	5184
Cumulative (No Action and All Tracts)	2242	4747	2955	

[1]Soil types disturbed, incident to underground mining, can be determined only following a mine plan submission.

[2]An artificial term to describe a grouping of soils.

Source: MMS Tract Delineation Reports and professional judgment.

Good soils have a deep loamy texture in the surface and subsoils, gentle slopes, better water-holding capacity, and high natural productivity. Fair and poor soils are shallow, have less of a loamy surface, increased amounts of clay in the subsoil, steep to very steep slopes, high erosion potential, and less natural productivity. A greater possibility exists in the areas of good soils for a permanent decrease in natural productivity. On the other hand, areas to be mined, consisting primarily of poor soils, present opportunities to significantly increase the long-term productivity of the soil resource.

COMMITTED MITIGATION

Data collection and analysis were drawn from Soil Conservation Service Soil Surveys, a BLM-funded soil characterization study, and professional judgment. This information was sufficient to point out potential reclamation problems resulting primarily from soil characteristics. No additional mitigation measures beyond regulatory authority are proposed at this time.

UNCOMMITTED MITIGATION

Resource recovery and protection plans are individually reviewed by OSM, and additional mitigating measures can be included. Reclaiming

the disturbed steep slopes at less than approximate original contour, could reduce long-term erosion potential. Increased runoff-time also would allow more water to infiltrate the soils, thus, accelerating the soil development process and reducing the flood potential. Office of Surface Mining regulations (30 CFR 785.16 and 826.15) provide for limited variances for steep slope mining.

Timing the topsoil replacement so that it does not coincide with the heaviest rainfall period also could reduce soil lost dueto erosion. Terracing the reclaimed soils, too, may aid in reducing erosion. This practice could also help increase the water infiltration rate.

UNAVOIDABLE ADVERSE IMPACTS

The residual adverse impacts that can be expected are: 1) alteration of soil structure and texture in the mined soils due to mixing and compaction, 2) an inevitable loss of some topsoil materials, through handling and erosion to the settling pond, 3) a temporary loss of vegetative production during operations, and 4) a temporary decline in plant productivity due to loss of some soil microorganisms.

SHORT-TERM VS LONG-TERM

Revegetation will be immediate and continuous, but will take approximately 10 years to reach the standards specified in OSM regulation 30 CFR 817.116. For some tracts, it is probable that long-term vegetative productivity will exceed premining levels. This is due to the fracturing of the of the impermeable substrata underlying the poor, shallow soils that cover large areas of the tracts.

IRREVERSIBLE/IRRETRIEVABLE COMMITMENT OF RESOURCES

The mixing of the natural soil profile and the consequent loss of the premining developed horizons is irreversible. Some downslope soil movement, caused by erosion, can be considered as irretrievable.

CULTURAL RESOURCES

Coal mining produces impacts on cultural resources primarily through surface disturbance of the area where resources are located, with subsequent damage to, or alteration of, the resources. The potential for unknown, buried archeological sites exists within each proposed lease tract and associated rights-of-way. Although surface mining activities disturb a larger surface area, underground mining can also impact cultural properties from the construction of surface facilities,

blasting, and subsidence. Disturbance of cultural properties can also occur through indirect activities related to mining. For example, an increase in population could possibly lead to the increase in vandalism and treasure hunting. Because cultural resources are non-renewable, the physical distruction of any cultural data or artifacts could have a potentially negative impact on efforts to reconstruct the prehistoric and historic culture history of the region.

Estimates of the types of cultural properties threatened from mining activities over Federal coal are based on a 1978 BLM Class II sample field inventory (10 percent sample of 66,120 acres of FMO). The existing data base indicates that prehistoric and historic resources in the proposed lease areas are small and relatively insignificant properties. There are no National Register of Historic Places (NRHP) listed or nominated properties located on any of the proposed lease tracts. NRHP eligibility for known sites on the proposed tracts has not been determined at this time. Currently unlocated cultural resources will probably be relatively noncomplex properties which may contain scientific information. However, there is low potential that resources of this type will be eligible for listing on the NRHP.

It is impossible to evaluate the significance of most impacts to cultural resources until such resources have been located as a result of intensive field inventory for each tract which is leased. Intensive inventories are required through lease stipulations; however, areas of inventory cannot be determined until mine plan submission. The location data of cultural properties through required inventory will be beneficial in the long-term and should have positive effects by providing additional knowledge about the Fall Line Hills region concerning prehistoric site distribution as well as knowledge of late 19th to mid 20th century American settlement patterns.

Table 4-11 gives a tract-by-tract breakdown of the number of known cultural resources which could be impacted by mining activities.

MITIGATING MEASURES

Compliance with legislation, the National Historic Preservation Act of 1966, as amended (P.L. 96-515) and regulations (36 CFR 800) relating to cultural resource consideration and protection in Federal actions require consultation with the State Historic Preservation Officer (SHPO) and the Advisory Council of Historic Preservation (ACHP). Appropriate consultation with the Alabama SHPO and other qualified cultural resource specialists is being conducted during EIS preparation and decision-making on Federal coal leasing in Alabama.

To facilitate compliance and consultation for the entire Federal Coal Management Program (FCMP), the Programmatic Memorandum of Agreement (PMOA), was established and became effective on May 20, 1980, and was amended in March 1983 (ACHP, May 1980 and March 1983). The PMOA as presently structured provides guidance for Departmental-wide

consideration for the protection of cultural resources during all stages of FCMP. Its major function is to identify an agreeable streamlined method for examining impacts on cultural resources resulting from a class of actions, whereby site-specific section 106 consultation procedures with the ACHP (36 CFR 800.8) may be avoided in most instances.

In accordance with the terms of the PMOA as presently structured BLM will require the following lease terms and stipulations as mitigating measures:

> (1) That a BLM Class III (intensive field) inventory be performed prior to mine plan approval. This inventory should be conducted by qualified cultural resource specialists on all areas subject to ground disturbance, and which were not previously inventoried at such a level of intensity. Provisions should be made for appropriate resource evaluation, recordation, data recovery and protection from adverse effects for specific cultural resource properties identified. Curation of site data should be arranged with an approved public institution within the State of Alabama. An acceptable report of the work undertaken will be submitted to the BLM and the Alabama SHPO.
>
> (2) That all cultural resources be evaluated according to the Criteria of Eligibility (36 CFR 60.6).
>
> (3) That all prudent and feasible means be utilized to avoid adverse effect to significant cultural resources.
>
> (4) That if adverse effect cannot be prudently or feasibly avoided then mitigating measures specific to the qualifying characteristic(s) of the cultural resource be completed in accordance with the ACHP's publication entitled, "Treatment of Archeological Properties: A Handbook" (November 1980).

In view of these requirements, all impacts are manageable. In terms of time available prior to surface disturbance, it is both prudent and feasible to conclude that the requirements can be met for any alternative. Failure to fulfill the requirements would produce unacceptable adverse effects in any alternative, because the Determination of Eligibility criteria (requirement no. 2) have not been met.

UNAVOIDABLE ADVERSE IMPACTS

Mining operations and support facilities will produce ground disturbance which would damage or destroy cultural properties that are located near areas of surface alteration. Although a required intensive

field inventory will be conducted prior to surface disturbing activities, there is potential for loss of unknown buried archeological resources which were not discovered during inventory and which may exist within the project area or associated rights-of-way.

Pothunting, casual arrowhead collecting, and vandalism due to population increases and greater accessibility to mining units would result in the reduction of the integrity of cultural properties; the extent of such losses, as well as the loss of scientific values, could not be determined. Subsidence, reclamation practices, and erosion may produce offiste impacts following mining. The extent of loss form construction of offsite facilities would be unknown.

SHORT-TERM VS LONG-TERM

Use of the tracts for mining coal may allow current recovery of cultural resource data, but would preclude data recovery by improved techniques in the future. Extensive mining also would alter the regional environmental and cultural context, which could make systematic study and future prehistoric and historic cultural reconstruction difficult. The beneficial, long-term impacts from proposed coal development will be the acumulation of knowledge about the cultural history and prehistory of the general region as a result of required inventories.

IRREVERSIBLE/IRRETRIEVABLE COMMITMENT OF RESURCES

Cultural resources are non-renewable. Once destroyed, they cannot be replaced.

RECREATION

The additional growth associated with the different alternatives can be expected to have a minor impact on existing urban recreational facilities. Alternative Four (leasing of all the tracts), is expected to produce an increase in population throughout the 3-county area of approximately 990 people by 1995. Table 4-12 depicts this population increase and probable areas impacted. This increase in population will amount to an increase of about .4 percent of the present population. Of the 3-county area, the Tuscaloosa-Northport municipalities will experience the highest absolute increase in population, as related to the Federal coal leasing program. Under Alternative Four, this will amount to an increase of less than .8 percent of the present population.

Recreational opportunities outside urban areas are primarily oriented toward water sports or hunting. The lands with a high concentration of Federal Minerals Ownership (FMO) and adjacent lands, are basically devoid of formally designated recreation areas. The two major exceptions are

the Wolf Creek Wildlife Management Area and the Piney Woods Wildlife Management Area (Gulf State Hunting Area). Chapter 3 describes these management areas.

MITIGATING MEASURES

The land must be reclaimed as prescribed by the state and Federal law. Reclamation of those lands affected by mining on the Wolf Creek Wildlife Management Area should be coordinated with the State of Alabama Department of Conservation and Natural Resources. This can be accomplished through the efforts of the state regulatory agency, ASMC.

IRREVERSIBLE/IRRETRIEVABLE COMMITMENT OF RESOURCES

There are no irreversible commitments of recreational resources if reclamation is properly carried out.

SHORT-TERM VS LONG-TERM

The short-term use of the land for coal mining should not affect the long-term capability of the recreational resources, assuming mining and reclamation regulations are followed.

VISUAL RESOURCES

Existing coal mining-related landscape disturbance is widely scattered, but locally intensive within the three counties. In several locations, roads pass through large areas where most of the viewshed is composed of strip-mining operations. Mining-related surface disturbance has degraded visual quality at the mining site and in surrounding areas, primarily because of erosion and acid drainage. All natural scenery has been destroyed and the visual impression is one of massive forms, broken lines, harsh colors, and coarse textures.

Although mining operations do exist along heavily-traveled highways, the most intensively mined areas are located off county roads, with low to moderate traffic volumes. OSM regulations (30 CFR 816.100, 817.100) require that vegetation be reestablished and land mass returned to approximate original contour, contemporaneously with mining activities. The continuing process of reclamation has decreased the severity of visual degradation in the area. Complete reclamation of mined areas will not occur until the end of mine life.

UNAVOIDABLE ADVERSE IMPACTS

Surface mining and the surface disturbance of land for underground mining in the areas of proposed Federal coal leasing will create locally sharp contrasts to the normal line and texture of horizons and detract from the scenic quality of the area. These impacts are not regionally significant, as the visual resources impacted are not unique or outstanding in any way.

SHORT-TERM VS LONG-TERM

The BLM has no direct visual resource management responsibility within the EIS region. Individual landowners may, at any time, exercise their right to change the land use and the visual quality of the landscape.

IRREVERSIBLE/IRRETRIEVABLE COMMITMENT OF RESOURCES

There should be no irreversible or irretrievable commitment of visual resources, provided that proper reclamation is accomplished.

SOCIOECONOMIC ENVIRONMENT

DEMOGRAPHIC IMPACTS

Two sequential steps were involved in estimating the impacts on population, employment and income in the 4-county area. First, the secondary impacts of changes in mining employment were calculated, using income and employment multipliers developed by Alabama A&M University (1983). Second, mining and secondary employment for each tract was allocated to specific communities by means of a gravity model (BLM, 1980; Dickerman, 1979-80). The gravity model used: 1) each community's present population figure as a positive factor attracting new population, 2) community attractiveness (a figure from 1 to 10 used to evaluate availability of housing, public facilities, services and other amenities in a community) as a positive or negative factor, and 3) distance (measured in driving time) from a community to a mine as a negative factor. The allocated employment figure was converted to a total population impact using the relationship between total population and total nonagricultural employment.

Because of the high number of unemployed persons in the 4-county area (approximately 65,590 in January 1983), as well as the relatively high income for miners and the moderate anticipated growth under the no action

alternative, most of the new jobs provided by mining construction and operation, resulting from new Federal leasing, would be filled by area residents (Brantley, 1980; Ford, 1980; Dunlop, 1980). Most of the construction will be contracted. (Additionally, there are some 400 construction workers out of work in this UMWA district.) The in-migrating mine employees will be about 10 percent for underground mines, and will include some administrative leadership positions, specialists, and section chiefs or foremen (Ellis, 1979; Hendricks, 1979; Kelly, 1980). There should be no in-migration for surface mining operations since, as of March, 1983, there were approximately 3,000 unemployed surface miners in this UMWA district.

Table 4-12 shows the population growth expected to occur as a result of each of the alternatives. It is anticipated that in-migration will result only from underground mining in Alternatives Two, Three, and Four. Under the no action alternative (Alternative One), a baseline population growth of 6-7 percent is expected to occur in the study area between 1980 and 1995, because of already projected growth (Alabama A&M University, 1983). The growth resulting from Federal leasing under Alternative Four represents an additional population increase for the area over the same period of .20 percent. The most significant impacts to occur in area communities over the 1980 to 1995 period will occur in Berry, 15.4 percent; Tuscaloosa, .71 percent; Northport, .47 percent; and Birmingham, .14 percent. The remainder of the communities under each of the three Federal leasing alternatives will receive less than 1.0 percent growth over the period. With the exception of Berry, these population impacts can be described only as being of low significance.

EMPLOYMENT AND INCOME

Tables 4-13 and 4-14 show the impacts on employment and income, respectively, for 1995. New Federal leasing would increase total employment in the impacted area by 1995 from 1.03 percent on Alternative Two (least impacts) to 1.08 percent on Alternative Four (most impacts). This figure includes secondary employment and is of low significance. However, the figure for Mining Employment is of higher significance, with an 8.7 percent increase under Alternative Two and an 11.9 percent increase under Alternative Four. Income for the mining sector would increase 8.4 percent and 11.7 percent, respectively.

Impacts would vary somewhat between counties. Total employment and income impacts would be the greatest in Fayette County at 7.3 percent and 7.3 percent respectively, and the least in Jefferson County at .49 percent and .50 percent, respectively, under Alternative Four. The employment impacts in Tuscaloosa and Walker Counties would be 3.2 and .51 percent, respectively, while the income impacts would be 3.2 and .80 percent, respectively.

In terms of employment sectors, mining would have the largest impact, with an 11.9 percent area impact under Alternative Four. Fayette County

would experience the greatest growth in the mining sector at 43.9, followed by Tuscaloosa County at 24.8, Jefferson County at 14.9, and Walker County at .51. Under Alternative Two, the counties would experience similar growth in the mining sector, with Fayette at 41.5, Tuscaloosa at 15, Jefferson at 11.1, and Walker at .43.

The mining sector income impacts (which were derived by applying total mining employment to the projected average annual income per miner) of Alternative Four would be as follows: Jefferson County, $44.8 million; Tuscaloosa County, $37.7 million; Fayette County, $10.8 million; and Walker County, $2.7 million.

Again, under Alternative Two, the mining income impacts would be almost the same, with Jefferson County at $33.5 million; Tuscaloosa, $22.8 million; Fayette, $10.2 million; and Walker, $2.3 million.

Impacts on other sectors of employment and income, which represent the indirect (or secondary) effects on local commercial and governmental service activities, would be small, both in numbers and percentages. The new mining jobs, resulting from Federal leasing, could tend to support rather than create secondary jobs (Jacquot, 1979-80). What will be experienced in the impacted area will not be the "boom town" situation which is occurring in the West. This is because the commercial and governmental service activities already exist in the area and could be enlarged, if necessary, instead of created. Construction employment and income have not been discussed heretofore because the impact on construction would be short-term in nature and, for the most part, would be undertaken by contract construction companies. In addition, there are presently 400 mining construction workers out of work in the UMWA district covering the affected area, and projected construction employment is only expected to be approximately 550 persons will involve only four mines, and will last only a few years. It will, however, involve a total annual income of $9.9 million over a 1-1/2 to 2-year period.

In summary, the new Federal leasing would cause relatively slight impacts in overall area income and employment, while having a significant impact on mining employment and income. The employment impact on the mining sector in Fayette and Tuscaloosa Counties will be very significant at 43.9 percent and 24.8 percent, respectively; while the impact in the remaining counties would be moderately significant, ranging from .80 percent to 14.9 percent.

HOUSING, COMMUNITY FACILITIES AND SERVICES

Projections of changes in population, in the number of households, and in the number of school-age children in each of the communities and counties in the affected area provide the basis for an assessment of increased facilities and service demands in those towns and jurisdictional units, resulting from Federal leasing (Willard, 1980; Chalmers and Anderson, 1977; Mountain West Research, 1978). Table 4-15

gives the criteria for evaluating a particular facility or service, as well as the anticipated impact under the alternatives reviewed in this statement. Impacts are shown for the year 1990 (unlike other sections of the EIS which address effects in 1995) because the highest threshhold of effects on community facilities will occur in 1990. This allows for a "worst case" analysis.

HOUSING

The purpose of this section is to convert the population projections (discussed above) into projections of the number of households added to each community as a result of the Federal leasing program. Table 4-15 gives the projected standard household size in 1990 for the counties and communities in the study area, as well as the increases projected by alternative over the 1980 housing counts (U.S. Census, 1980). As can be seen, the no action alternative (Alternative One), which is the growth from baseline conditions, represents the greatest impact, with a total additional requirement of 17,737 units for the 10-year period. This figure includes approximately a 4.5 percent built-in overall vacancy rate. The total need under all alternatives (other than the no action alternative) is 801 units, which creates a shortage of approximately 36 units in the 4-county area. This impact can be described as insignificant.

SCHOOLS

Table 4-15 projects the increase/decrease in school age population in 1990 under the no action alternative and under Alternative Four. Personal communication by telephone with all Boards of Education in the 4-county area indicates that the increases projected under Alternative Four are considered insignificant in view of declining enrollments and existing excess capacities.

HEALTH FACILITIES

The health facilities analyzed in this statement include hospitals, nursing homes, and ambulance services. Number of beds and occupancy rates were reviewed for hospitals and nursing homes. On the basis of the standards set by the West Alabama Health Council and the Birmingham Regional Health Systems Agency, it is estimated that there is sufficient room for growth in the area health facilities for the no action alternative. The other alternatives represent population growth of 1,981 by 1990, which is considered insignificant (i.e., the present Federal standard for hospital beds is 4 per 1,000 persons, so the need is for only 7-8 beds for the additional population).

Numbers of ambulances and manpower were reviewed for ambulance service. While significant increases will be required under the no action (baseline) alternative, only insignificant impacts can be anticipated as a result of the in-migration of the 1,981 people projected under the other alternatives.

POLICE AND FIRE

Table 4-15 also shows the significance of the impact of the no action alternative on police and fire (Public Safety) services, and the relative insignificance of the impacts anticipated under the Federal leasing alternatives.

WATER, SEWER AND SOLID WASTES

Water supply and demand were addressed in the Water Resources section and will not be discussed further here. Both sewer and solid waste services will be significantly impacted under the no action alternative, because of the anticipated area growth between 1980 and 1990 (Alabama A&M University, 1983). The limited growth anticipated under the remaining alternatives will insignificantly impact such facilities and services.

FISCAL IMPACTS

The fiscal impact analysis undertaken here will address public revenues received by area counties and the state as a result of Federal leasing. Included are increases brought by royalties and severance taxes, increases in personal income and property acquisition, and the additional costs as a result of growth-related demands on community facilities and services.

Revenue from Federal royalties, of which 50 percent are returned to the state, are illustrated in table 4-16. Annual royalties under the no action alternative (1995) are $3.7 million, while impacts of the other alternatives range from $9.1 million annually under Alternative Two to $11.3 million annually under Alternative Four.

Revenue from the severance tax, which is 33.5 cents per ton on all coal removed, also is included in the table. The impacts of all alternatives will range from $1.1 million annually under the no action alternative to $2.8 million annually under Alternative Four. These funds can be used in the mitigation of the impacts of Federal leasing in the area.

The increases in personal income, which will result in increased property acquisition and demand for goods and services, will have mixed impact significance. The impact of mining-related and total income under the no action alternative (1995) will be approximately $512.5 million and $6.13 billion, respectively. Mining-related personal income through all Federal leasing alternatives, will range from $68.9 million under Alternative Two, to $96.0 million under Alternative Four.

Increased costs for housing and community facilities and services will be low under all alternatives, except the no action, as a result of the very small .20 percent projected population growth. The 6 to 7 percent growth rate expected under the no action alternative will,

however, have a significant impact on all facility and service areas of infrastructure. These costs should be paid for by increased property taxes, sales taxes, state income taxes, occupational taxes, and other state and local taxes, and user fees resulting from the increases in population. They are being planned for by area planning agencies under housing and community facilities plans, and by agencies specifically responsible for providing such facilities and services. Any additional costs resulting from Federal leasing should be mitigated by the severance taxes and royalties, and by the taxes paid by the miners and their families.

COMMUNITY SOCIAL STRUCTURE AND ATTITUDES

Changes in social structure and attitudes should not occur with the minimal in-migration brought under the three Federal leasing alternatives. Impacts will be felt as a result of the no action alternative, however. Social structure impacts should be insignificant under the no action alternative, due to relatively low anticipated rate of growth (6 to 7%). The impacts on attitudes and expectations may be negative toward BLM and the Federal Government. This negative attitude would result from failure of some area residents to understand the reasoning behind a no lease decision and its apparent "bad management" appearance. A few citizens, as well as coal company officials and employees, would question the lack of action because of the country's energy needs, economic feasibility of mining, and lack of significant environmental impacts. Also some coal company officials and area residents may become discouraged by a program which both recommends the use of coal and stands in the way of its potential leasing.

TRANSPORTATION

HIGHWAYS

With no new federal coal leasing program, the road systems for the 3-county area should be adequate into the year 2000 (BLM, 1980).

The average daily traffic (ADT) can be expected to increase slightly as a result of surface and underground mining of federally-owned coal in the area. The projected ADT listed in table 4-17 represents those roads that would receive the heaviest traffic flow as a result of leasing under Alternative Four (the leasing of all proposed tracts). This also takes into account that there are only one or two dispersion points that would be the destination of the haul trucks.

The lack of data precludes analysis of indirect trips and trips associated with in-migration of mine employees. The capacity figures used in this analysis were determined from the capacity equation used by

the State of Alabama Highway Department, based upon road geometrics. ADT figures were computed by developing a trend line, based upon existing usage and adding projected increases in truck traffic. The volume to capacity ratios are computed by multiplying the ADT by the design hour volume as a percentage of the average daily traffic and then dividing the new figure by the design capacity number.

$$V/C = \frac{ADT \times K}{C}$$

where: V/C = Volume-Capacity Ratio
ADT = Average Daily Traffic Volume
K = K-Factor expressed as decimal
C = Hourly Capacity

If the computed coefficient is greater than 1.0, a drop in the level of service may be expected. The service level of the roads under study should not decrease under any of the alternatives.

Table 4-17. Projected Average Daily Traffic and Volume to Capacity Ratios

Year	SR 69		SR 269		CO 20	
	ADT	V/C	ADT	V/C	ADT	V/C
1983	1951	.15	5270	.45	2760	.25
1995	2399	.18	6113	.53	3202	.29

Source: Compiled from State of Alabama Highway Department Needs Analysis

A limited number of unpaved county roads may be relocated if approved by OSM. Relocation of these roads would involve only minimal distances and will not have a significant impact on traffic flows. If relocation of any does occur it should be coordinated with the appropriate county and/or state highway official.

RAILROADS

The rail systems associated with the tract area are well developed and should be able to handle the proposed new tonnages without any difficulty. Unit coal trains and mixed trains provide service to the general tract area and their companies would be willing to develop contractual agreements between the different interested parties (Alvin L. Stephens, District Coal and Ore Traffic Manager, Norfork Southern Corp., 1983).

Approximately 520,220 tons of coal per month is hauled through and out of the 3-county area by rail. This is achieved through the use of both unit coal trains and mixed trains.

The following table illustrates the possible monthly load tonnages by alternative. These figures are based on an over-all state figure of approximately 41 percent coal haulage by rail.

Transportation Mode	Alternative One (Baseline)	Alternative Two	Alternative Three	Alternative Four
Rail	218,666	235,750	289,333	361,166

Source: Geological Survey of Alabama, "Alabama Coal Data For 1981".

WATERWAYS

In 1981, approximately 13,000,000 tons of commodities were transported through the William B. Oliver Lock, according to the U.S. Corps of Engineers.

The following table shows the projected increase in barge traffic by alternative. Increases are listed in millions of tons per year.

Transportation Mode	Alternative One (Baseline)	Alternative Two	Alternative Three	Alternative Four
Barge	1,344	1,449	1,779	2,220

The Corps of Engineers has determined that nonstructural changes at the lock would increase capacity to more than 20 million tons. This would be adequate under any of the alternatives.

UNAVOIDABLE ADVERSE IMPACTS

Unavoidable adverse impacts, which will result from the leasing of Federal coal, are slight increases in traffic, road congestion, accidents, and grade crossing hazard rating. The increase in maintenance costs are difficult to assess without more specific data on specific routes.

SHORT-TERM VS LONG-TERM

With increased tax dollars from the coal mining and use of the haul trucks, the roads should be repaired and there would be no long-term effect.

IRREVERSIBLE/IRRETRIEVABLE COMMITMENT OF RESOURCES

Loss of life and property in traffic accidents are irretrievable.

NET ENERGY ANALYSIS

Each alternative represents a production surplus when energy produced in mining is compared to energy consumed in mining. A discussion of the methodology and assumptions used in this analysis is contained in appendix D of the first round EIS (BLM, 1980) and in appendix E of this EIS.

Table 4-18. Net Energy Analysis for Alternative One (no action)

Tract	Type	Energy Ratio*
Jess Creek	Underground	270:1
North River	Underground	220:1
Upper North River Bypass	Underground	220:1
Rock Springs Church	Underground	250:1
Howard	Surface	38:1
Brannon Creek	Surface	38:1
Upper Sulfur Springs Ch.	Surface	43:1
Piney Woods Church	Surface	43:1
Elm Grove	Surface	34:1
Little Tyro Creek	Surface	25:1
Dividing Ridge	Surface	95:1
Flatwoods	Surface	25:1
Goodwin Creek	Surface	48:1

* Energy Ratio = $\frac{\text{Energy Produced}}{\text{Energy Consumed}}$

Table 4-19. Net Energy Analysis for All Tracts

Tract	Type	Alternatives	Energy Ratio*
Blue Creek	Underground	2, 3, 4	245:1
Cripple Creek	Underground	2, 3, 4	239:1
Sandtown	Underground	2, 3, 4	220:1
Revised Wiley	Underground	4	300:1
Revised Bagwell Road	Surface	3, 4	22:1
Revised Boxes Creek Bypass	Surface	2, 3, 4	13:1
Revised Crabbe Road	Surface	3, 4	22:1
Jock Creek	Surface	2, 3, 4	19:1
Lockhart Hill	Surface	3, 4	15:1
Panther Branch	Surface	2, 3, 4	22:1
Revised Pendley	Surface	3, 4	15:1
Pleasant Grove Church	Surface	2, 3, 4	19:1
Revised Poplar Hollow	Surface	3, 4	25:1
Spencer Hill	Surface	3, 4	22:1
Revised Watermelon Road	Surface	3, 4	22:1
Revised Willis Chapel	Surface	3, 4	15:1

* Energy Ratio = $\frac{\text{Energy Produced}}{\text{Energy Consumed}}$

Table 4-1. Area of Aquifer Removal or Disturbance to the Year 1995, and Estimated Number of Wells to be Affected at Different Levels of Federal Coal Development

Tracts	Approximate Acres of Potential Aquifer That Will Be Disturbed	Estimated Number of Wells That May be Destroyed or Impaired*	Estimated Private Acres to be Mined with Previously Leased Federal Coal
Alternative I (No Action) (Baseline)			
Dividing Ridge	460	0	123,000
Howard	590	9	
Jess Creek	200	15	
Piney Woods Church	50	3	
Brannon Creek	310	0	
Flatwoods	800	15	
Little Tyro Creek	840	0	
Upper North River	0	0	
Goodwin Creek	300	1	
Upper Sulfur Springs Church	495	13	
North River	400	0	
Elm Grove	550	13	
Rock Springs Church	400	0	
Stovall Files (1979)	365	0	
North River Energy Co. (1974)	5	0	
Total (No Action)	5,765	69	
Alternative II			
Boxes Creek	100	20	123,000
Jock Creek	630	0	
Panther Branch	765	3	
Pleasant Grove Church	260	2	
Blue Creek	11,520	40	
Cripple Creek	14,880	67	
Sandtown	12,760	98	
Alternative I Tracts	5,765	0**	
Total (Alternative II)	46,680	230	

* Federal coal lease tracts only
** Overlap with wells in No Action Alternative considered

continued

Table 4-1 (continued)

Alternatives and Tracts	Approximate Acres of Potential Aquifer That Will Be Disturbed	Estimated Number of of Wells That May Be Destroyed or Impaired*	Estimated Private Acres to Be Mined Without Federal Coal Leasing
Alternative III (Preferred)			
Revised Willis Chapel	75	5	123,000
Revised Crabbe Road	310	9	
Revised Bagwell Road	300	16	
Revised Pendley	110	13	
Lockhart Hill	470	5	
Revised Boxes Creek By-Pass	100	20	
Jock Creek	630	0	
Panther Branch	765	3	
Pleasant Grove Church	260	2	
Poplar Hollow	825	34	
Spencer Hill	735	11	
Watermelon Road	600	15	
Blue Creek	11,520	40	
Cripple Creek	14,880	67	
Sandtown	12,760	98	
Alternative I Tracts	5,765	0**	
Total (Alternative III)	50,105	338	
Alternative IV (All Tracts)			
Revised Wiley	13,520	48	123,000
Alternative I Tracts	5,765	0**	
Alternative III Tracts	50,105	338	
Total (Alternative IV)	69,390	386	

* Federal coal lease tracts only
** Overlap with wells in No Action Alternative considered

Table 4-2. Estimated Water Use Resulting from Mining Federal Coal

ALTERNATIVES	Est. Water Use for Mining In Gallons Per Day (GPD)	Probable Source
Dividing Ridge	1,000	Big Yellow Creek
Howard	1,000	Wolf Creek
Jess Creek	13,600-55,400	Lost Creek
Piney Woods Church	3,750	Dry Creek
Brannon Creek	1,000	Wolf Creek
Flatwoods	1,000	Big Yellow Creek
Little Tyro Creek	1,000	Bear Creek
Upper North River	40,000	North River
Goodwin Creek	75,000	Goodwin Creek
Upper Sulfur Springs Church	1,000	unnamed tributary
North River	735,000	North River
Elm Grove	750	unnamed tributary
Rock Springs Church	74,000	Black Warrior R.
Stovall-Files (1979)	300	Boxes Creek
North River Energy (1974)	75	Little Creek
Total (No Action)	948,475-990,275	
Boxes Creek	3,400	Boxes Creek
Jock Creek	22,000	Blue Creek
Panther Branch	42,500	Black Warrior R.
Pleasant Grove Church	6,600	North River
Blue Creek	796,000	Blue Creek
Cripple Creek	617,000	Cripple Creek
Sandtown	485,000	Tyro Creek
Alternative I Tracts	948,475-990,275	
Total (Alternative II)	1,950,975-1,992,775	
Revised Willis Chapel	1,400	Pendley Creek
Revised Crabbe Road	8,100	Cripple Creek
Revised Bagwell Road	8,420	Blue Creek
Revised Pendley	2,800	Pendley Creek
Lockhart Hill	7,320	Erie Creek
Revised Boxes Creek By-Pass	3,410	Boxes Creek
Jock Creek	22,000	Blue Creek
Panther Branch	42,500	Black Warrior R.
Pleasant Grove Church	6,610	North River
Poplar Hollow	28,100	Tyro Creek
Spencer Hill	17,400	Blue Creek
Watermelon Road	31,000	Yellow Creek
Blue Creek	796,000	Blue Creek
Cripple Creek	617,000	Cripple Creek
Sandtown	485,000	Tyro Creek
Alternative I Tracts	948,475-990,275	
Total (Alternative III)	3,025,535-3,067,335	
Revised Wiley	623,000	Cripple Creek
Alternative I Tracts	948,475-990-275	
Alternative III Tracts	3,025,535-3,067,335	
Total (Alternative IV)	4,597,010-4,680,610	

Table 4-3. Projected Surface Water Quality Impacts Resulting from Mining Federal Coal Reserves Under Alternative I.

Tract Name	Water Monitor Site Number	Drainage Area (sq. mi)	0-2 years after mining								2-5 years after mining								5-11 years after mining							
			Spec. Conduct.		Sulfate		Dissolved Solids		Hardness		Spec. Conduct.		Sulfate		Dissolved Solids		Hardness		Spec. Conduct.		Sulfate		Dissolved Solids		Hard-ness	
			Q1*	Q2*	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q1	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2
Howard Stovall-Files	1	1.5	292	104	108	30	186	65	115	36	628	224	276	78	407	142	272	86	720	257	327	92	468	163	317	100
Howard Stovall-Files	2	2.1	441	157	179	50	284	99	184	58	948	338	459	129	620	216	431	136	1087	387	543	153	712	249	503	158
Howard Brannon	28	44.14	143	51	45	13	90	32	52	16	308	110	115	32	197	69	123	39	354	126	136	38	227	79	143	45
Flatwoods Upper Sulfur Springs Ch.	30	12.7	258	92	92	26	164	57	100	32	555	198	237	67	359	125	237	75	636	227	281	79	413	144	276	87
Howard Elm Grove Stovall-Files	33	4.7	294	105	109	31	188	65	116	37	632	225	278	78	410	143	274	86	725	258	330	93	471	164	319	101
Little Tyro	34	23.45	151	54	48	13	95	33	55	17	324	115	122	34	207	72	130	41	371	132	145	41	238	83	151	48
Little Tyro	35	7.59	569	203	245	69	368	129	244	77	1224	436	628	177	804	281	575	181	1404	500	743	209	925	323	670	211

*Q1=0.1 cfs/mi^2 of drainage area (low flow)
**Q2=1.5 cfs/mi^2 of drainage area (average flow)

Table 4-4. Projected Surface Water Quality Impacts Resulting from Mining Federal Coal Reserves Under Alternative II.

Tract Name	Water Monitor Site Number	Drainage Area (sq. mi)	0-2 years after mining								2-5 years after mining								5-11 years after mining							
			Spec. Conduct.		Sulfate		Dissolved Solids		Hardness		Spec. Conduct.		Sulfate		Dissolved Solids		Hardness		Spec. Conduct.		Sulfate		Dissolved Solids		Hard-ness	
			Q1*	Q2*	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q1	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2
Boxes Creek Howard Stovall-Files	1	1.5	320	114	120	34	205	71	128	40	688	245	309	87	447	156	301	95	789	281	366	103	514	179	351	111
Boxes Creek Howard Stovall-Files Pleasant Grove	2	2.08	473	169	195	55	305	107	198	62	1018	363	501	141	667	233	467	147	1168	416	593	168	766	268	545	172
Pleasant Grove	3	1.57	455	162	186	52	293	102	190	60	979	349	477	134	640	224	447	141	1123	400	565	159	736	257	522	164
Jock Creek	22	1.16	429	153	173	49	276	96	178	56	923	329	444	125	603	211	419	132	1059	377	525	148	694	242	488	154
Jock Creek	23	0.29	611	218	267	75	396	138	264	83	1315	469	686	193	865	302	623	196	1508	537	812	228	995	347	726	229
Jock Creek	24	2.27	668	238	298	84	433	151	291	92	1437	512	765	215	947	331	687	216	1647	587	905	254	1089	380	801	252
Panther Branch	25	3.56	526	187	222	62	340	119	273	70	1132	403	570	160	743	259	526	166	1298	463	675	190	854	298	614	193
Boxes Creek Howard Pleasant Grove Elm Grove Stovall-Files	33	4.70	307	109	114	32	196	68	122	38	660	235	294	83	428	149	287	91	756	270	347	98	492	172	335	106

*Q1=0.1 cfs/mi^2 of drainage area (low flow)
**Q2=1.5 cfs/mi^2 of drainage area (average flow)

Table 4-5. Projected Surface Water Quality Impacts Resulting from Mining Federal Coal Reserves Under Alternative III.

Tract Name	Water Monitor Site Number	Drainage Area (sq. mi)	0-2 years after mining								2-5 years after mining								5-11 years after mining							
			Spec. Conduct.		Sulfate		Dissolved Solids		Hardness		Spec. Conduct.		Sulfate		Dissolved Solids		Hardness		Spec. Conduct.		Sulfate		Dissolved Solids		Hardness	
			Q1*	Q2*	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q1	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2
Lockhart Hill	4	1,18	392	117	125	35	211	74	132	42	708	252	320	90	460	161	311	38	812	289	379	107	529	185	363	114
Lockhart Hill	5	0.57	437	156	177	50	281	98	181	57	939	335	453	127	614	214	427	134	1077	384	537	151	706	246	498	157
Lockhart Hill Willis Chapel	6	3.96	447	159	182	51	288	101	186	59	963	343	467	131	630	220	439	138	1104	393	553	155	724	253	512	161
Willis Chapel	7	3.59	200	71	68	19	127	44	76	24	431	154	174	49	277	97	178	56	494	176	206	58	319	111	208	66
Pendley	8	1.95	342	122	131	37	219	77	138	43	737	263	336	95	479	167	325	102	845	301	398	112	551	192	379	119
Poplar Hollow	9	2.33	611	218	267	75	396	138	264	83	1314	468	685	193	865	302	622	196	1507	537	811	228	994	347	725	228
Poplar Hollow	10	2.06	328	117	124	35	210	73	132	41	706	252	319	90	459	160	310	98	810	289	378	106	528	184	362	114
Poplar Hollow	11	1.22	551	196	235	66	356	124	235	74	1185	422	603	170	778	272	554	174	1359	484	714	201	895	312	646	203
Bagwell Road	12	1.78	301	107	112	31	192	67	119	38	647	231	287	81	420	147	281	89	742	264	339	95	483	168	328	103
Bagwell Road	13	0.47	501	178	209	59	323	113	211	66	1077	384	537	151	706	246	498	157	1235	440	635	179	812	283	581	183
Bagwell Road	14	2.59	320	114	120	34	205	71	128	40	688	245	309	87	447	156	301	95	789	281	366	103	514	179	351	111
Crabbe Road	15	2.54	286	102	105	30	183	64	113	36	615	219	270	76	399	139	266	84	706	257	319	90	459	160	310	98
Crabbe Road	16	1.44	349	124	134	38	224	78	141	44	751	268	345	97	489	171	333	105	862	307	408	115	562	196	307	122
Crabbe Road	17	0.49	629	224	277	78	408	142	273	86	1354	482	711	200	891	311	643	203	1552	553	841	236	1025	358	750	236
Crabbe Road	18	0.37	425	152	171	46	274	95	176	55	915	326	439	123	598	209	415	131	1049	374	519	146	687	240	483	152
Spencer Hill	19	2.09	310	111	116	33	198	69	124	39	668	238	298	84	434	151	292	92	766	273	353	99	499	174	340	107
Spencer Hill	20	2.88	362	129	140	39	232	81	147	46	778	277	360	101	507	177	346	109	892	318	426	120	582	203	403	127

*Q1=0.1 cfs/mi^2 of drainage area (low flow)
**Q2=1.5 cfs/mi^2 of drainage area (average flow)

Table 4-6. Projected Surface Water Quality Impacts Resulting from Mining Federal Coal Reserves Under Alternative IV.

Tract Name	Water Monitor Site Number	Drainage Area (sq. mi)	0–2 years after mining								2–5 years after mining								5–11 years after mining							
			Spec. Conduct.		Sulfate		Dissolved Solids		Hardness		Spec. Conduct.		Sulfate		Dissolved Solids		Hardness		Spec. Conduct.		Sulfate		Dissolved Solids		Hard-ness	
			Q1*	Q2*	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q1	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2	Q1	Q2
Spencer Hill	21	1.09	361	129	140	39	231	81	146	46	776	277	359	101	505	176	345	109	890	317	424	119	581	203	402	127
Watermelon Rd.	26	2.93	522	186	220	62	337	118	221	70	1123	400	565	159	737	257	522	164	1288	459	668	188	847	296	608	122
Pendley Willis Chapel Lockhart Hill	27	14.10	184	66	61	17	117	41	69	22	396	141	157	44	255	89	162	51	454	162	186	52	293	102	198	60
Pendley Howard Brannon, Willis Chapel Lockhart Hill	28	44.16	164	59	53	15	104	36	61	19	354	126	136	38	227	79	143	45	406	145	161	45	261	91	167	53
Crabbe Road	29	9.22	173	62	57	16	109	38	64	20	372	133	145	41	239	83	151	48	427	152	172	48	275	96	177	56
Poplar Hollow Flatwoods Bagwell Road Upper Sulfur Springs Ch.	30	12.72	277	99	101	28	176	62	109	34	595	212	259	73	385	135	256	81	682	243	306	86	443	155	299	94
Crabbe Road	31	5.23	229	82	80	23	146	51	88	28	493	176	205	58	318	111	208	65	566	202	243	68	366	128	242	76
Watermelon Rd.	32	10.99	214	76	74	21	136	48	82	26	235	84	82	23	149	52	90	28	508	187	213	62	328	118	216	70
Poplar Hollow Little Tyro Cr	34	23.45	183	65	61	17	116	41	69	22	395	141	156	44	254	89	162	51	453	161	185	52	292	102	189	59
Poplar Hollow Little Tyro Cr	35	7.59	685	244	307	86	445	155	300	94	1473	525	789	222	972	339	707	223	1690	602	934	262	1117	390	824	260

*Q1=0.1 cfs/mi^2 of drainage area (low flow)
**Q2=1.5 cfs/mi^2 of drainage area (average flow)

Table 4-7. Estimated Total Dissolved Solids in Tons Per Year That will Result from Mining at Alternative Levels

Years Since Mining Site**	Alternative I (Baseline) Tons/Year			Alternative II Tons/Year			Alternative III (Preferred) Tons/Year		
	0-2	2-5	5-11	0-2	2-5	5-11	0-2	2-5	5-11
1	144	315	362	158	346	397	158	346	397
2	308	671	774	329	717	825	329	717	825
3	--	--	--	237	520	597	237	520	597
4	--	--	--	--	--	--	129	281	323
5	--	--	--	--	--	--	80	181	208
6	--	--	--	--	--	--	592	1289	1483
7	--	--	--	--	--	--	234	515	590
8	--	--	--	--	--	--	222	482	554
9	--	--	--	--	--	--	476	1041	1197
10	--	--	--	--	--	--	223	488	561
11	--	--	--	--	--	--	224	491	563
12	--	--	--	--	--	--	177	387	443
13	--	--	--	--	--	--	79	171	197
14	--	--	--	--	--	--	272	598	686
15	--	--	--	--	--	--	241	523	601
16	--	--	--	--	--	--	166	364	418
17	--	--	--	--	--	--	103	226	260
18	--	--	--	--	--	--	52	114	131
19	--	--	--	--	--	--	213	467	538
20	--	--	--	--	--	--	345	754	865
21	--	--	--	--	--	--	131	284	327
22	--	--	--	165	362	415	165	362	415
23	--	--	--	59	116	149	59	116	149
24	--	--	--	507	1112	1277	507	1112	1277
25	--	--	--	627	1365	1570	627	1365	1570
26	--	--	--	--	--	--	512	1114	1284
27	--	--	--	--	--	--	856	1857	2129
28	2090	4508	5161	2090	4508	5161	2353	5163	5947
29	--	--	--	--	--	--	519	1133	1310
30	1071	2350	2707	1071	2350	2707	1167	2541	2918
31	--	--	--	--	--	--	395	859	991
32	--	--	--	--	--	--	781	846	2131
33	452	995	1141	473	1036	1196	473	1036	1196
34	1145	2499	2881	1145	2499	2881	1423	3089	3540
35	1449	3157	3628	1449	3157	1449	1741	3808	4381

* Based on an average discharge of 1.5 cfs

** See Map - for site locations

Table 4-9. Vegetative Types in Surface Minable Acreages, as of April 1982

Tract Name	Vegetative Type														Total**
	Pine Forest (Acres)		Mixed Forest (Acres)		Upland Hardwood Forest (Acres)		Riparian Systems (Acres)		Disturbed Lands (Acres)		Cleared Lands (Acres)		Clear Cuts (Acres)		
	Total	FMO	Total	FMO	Total	FMO	Total	FMO	Total	FMO	Total	FMO	Total	FMO	
Pendley (Revised)	5	5	105	105											110
Willis Chapel (Revised)	30	20	45	30											75
Bagwell Road (Revised)	55	35	235	85					10						300
Crabbe Road (Revised)	30	25	275	110	5	5			10	10					320
Lockhart Hill	60	35	360	80	55	5									475
Boxes Creek By-Pass(Rev.)	20	20	80	80											100
Spencer Hill	175	75	465	190									95	35	735
Pleasant Grove Church	70	20	190	80											260
Watermelon Road (Revised)	390	25	190	130			20	5							600
Jock Creek	285	45	335	240			5				5	5			630
Panther Branch	260	50	470	190	5		20	5			10	5			765
Poplar Hollow (Revised)	385	205	300	30	20	15					10	10	110	40	825
Total	1,765	255	3,050	1,110	85	25	45	20	10	10	25	15	205	75	5,195

* To the nearest five acres

** May disagree with tract delineation report because of rounding errors

Table 4-11. Cultural Resources Analysis

TRACT NAME Surface Tracts:	County	USGS 7.5' Quad Reference	No. known CR Present[1]	No. FMO Acres Previously Inventoried	% of Tract Inventoried	No. known CR in Mineable areas only[2] FMO	Other	Inventory Requirement
1. (R) Pendley	Fayette	Berry	0	120	19	0	N/A	Class III
2. (R) Willis Chapel	Walker	Howard/Berry	0	0	0	0	0	Class III
3. Lockhart Hill	Walker	Howard/Townley	0	0	0	0	0	Class III
4. (R) Boxes Creek Bypass	Fayette	Howard	2(H)	180	100	1 (1Fa59)	N/A	None
5. Pleasant Grove Church	Fayette	Howard	3(H)	280	33	1 (1Fa64)	0	Class III
6. (R) Crabbe Road	Tuscaloosa	Berry SE/Wiley	1(F)	40	3	0	0	Class III
7. (R) Bagwell Road	Tuscaloosa	Wiley	0	0	0	0	0	Class III
8. (R) Poplar Hollow	Fayette/Tuscaloosa	Berry SE/Wiley	2(H,F)	40	2	1 (1Tu408)	0	Class III
9. Jock Creek	Tuscaloosa	Windham Springs	1(H)	200	11	0	0	Class III
10. (R) Watermelon Road	Tuscaloosa	Windham Springs	0	40	2	0	0	Class III
11. Panther Branch	Tuscaloosa	Windham Springs	0	0	0	0	0	Class III
12. Spencer Hill	Tuscaloosa	Wiley/Windham Springs	2(H,M)	120	4	1 (1Tu354)	0	Class III
Underground Tracts:								
1. Sandtown	Fayette/Tuscaloosa	Berry/Berry SE/Wiley	[13] 5(P) 5(H) 2(M) 1(F)	1160	9	N/A		Class III
2. (R) Wiley	Tuscaloosa	Berry SE/Wiley/ Lake Tuscaloosa N	[5] 2(P) 2(H) 1(F)	320	2	N/A		Class III
3. Cripple Creek	Tuscaloosa	Berry SE/Wiley/ Lake Tuscaloosa N	[9] 3(P) 5(H) 1(F)	560	4	N/A		Class III
4. Blue Creek	Tuscaloosa	Wiley/Windham Springs	[6] 1(P) 3(H) 2(M)	600	5	N/A		Class III

Abbreviations: (P) Prehistoric; (H) Historic; (M) Multicomponent; (F) Standing Folk House; CR-Cultural Resources.

[1]Figures denote entire surface area of tract. A total of 29 known cultural resource properties could be impacted from proposed mining. Several tracts overlap, therefore causing some duplication of known cultural properties which are listed above.

[2]Known cultural resources to be impacted by surface disturbance in connection with underground mining cannot be determined until mine plan submission. Approximately 350 surface acres will be disturbed per undergound mine.

Sources: (Moorehead, Coblentz and Gillespie, 1978)
(Mistovich, Herbert and Willingham, 1982)

Table 4-12. Population Growth by Location and by Alternative, from 1980 to 1995
(In Thousands)

County/ Community	Population Impacts (as a result of in-migration of work force)							
	Alternative I No Action (Baseline)		Alternative II		Alternative III (Preferred)		Alternative IV (All Tracts)	
	1980	1995	1980	1995	1980	1995	1980	1995
Fayette	18.8	20.8	*	21.0	*	20.4	*	21.1
Berry	.9	1.1	*	1.3	*	1.3	*	1.3
Fayette	5.3	6.1	*	6.1	*	6.1	*	6.1
Jeff./B'ham	671.3	698.7	*	699.4	*	699.4	*	699.7
Tuscaloosa	137.5	158.9	*	159.4	*	159.4	*	159.6
Northport	14.3	21.1	*	21.1	*	21.1	*	21.2
Tuscaloosa	75.2	84.1	*	84.5	*	84.5	*	84.7
Walker	68.7	79.5	*	79.9	*	79.9	*	79.5
Carbon Hill	2.4	2.8	*	*	*	*	*	*
Oakman	.7	.7	*	.8	*	.8	*	.8
Jasper	11.9	12.7	*	12.8	*	12.8		12.7

Alabama A & M University, 1983.

* No additional population growth from Federal leasing.

Table 4-13. Employment Impacts by Alternative, by County

1995

Alternatives	Counties/Employment							
Number and Percent	Fayette		Jefferson		Tuscaloosa		Walker	
of Total Increase	Mining	Total	Mining	Total	Mining	Total	Mining	Total
Alternative I 1980	700	5,214	5,038	273,354	2,210	32,235	5,229	15,640
No Action (Baseline) 1995	923	8,007	10,735	476,206	4,709	52,424	11,142	25,418
Alternative II								
#	+ 383	+ 553	+1,199	+1,738	+ 708	+1,030	+ 75	+ 109
%	+ 41.5	+ 6.9	+ 11.1	+ .36	+ 15	+ 2	+ .67	+ .43
Alternative III (Preferred)								
#	338	+ 559	+1,199	+1,738	+ 778	+1,112	+ 77	+ 112
%	+ 42	+ 6.99	+ 11.2	+ .36	+ 16.5	+ 2.1	+ .70	+ .44
Alternative IV (All Tracts)								
#	+ 406	+ 585	+1,600	+2,319	+ 1,169	+1,677	+ 89	+ 130
%	+ 43.9	+ 7.3	+ 14.9	+ .49	+ 24.8	+ 3.2	+ .80	+ .51

Sources: Alabama A&M University, 1983
Minerals Management Service, 1982
Gravity II Model, (BLM Computer Center, Denver)

Table 4-14. Income Impacts by Alternative, by County

1995

Alternatives (Number and percent of total increase)	Counties/Income (1,000s of Dollars)									
	Fayette		Jefferson		Tuscaloosa		Walker		Study Area	
	Mining	Total	Mining	Total	Mining	Total	Mining	Total	Mining	Total
Alt. I (no action) (baseline) 1980	16,118	60,446	109,835	3,802,243	55,551	408,420	125,294	228,921	306,798	4,500,030
1995	24,589	120,305	300,338	9,123,069	151,900	871,193	342,644	512,070	819,471	10,626,637
Alt. II										
Number	+10,203	+8,309	+33,544	+33,937	+22,838	+17,117	+2,306	+2,196	68,891	61,559
Percent	+41	+6.9	+11.2	+.37	+15	+1.97	+.67	+.43	+8.4	+.58
Alt. III (preferred)										
Number	+10,336	+8,399	+33,544	+33,937	+25,095	+18,479	+2,368	+2,256	71,343	63,071
Percent	+42	+7.0	+11.2	+.37	+16.5	+2.12	+.69	+.44	+8.7	+.59
Alt. IV (all tracts)										
Number	+10,816	+8,790	+44,763	+45,283	+37,708	+27,868	+2,737	+2,619	96,024	84,560
Percent	+44	+7.3	+14.9	+.50	+24.8	+3.20	+.80	+.51	+11.7	+.80

Source: Alabama A & M University, 1983.

Table 4-15. Housing and Community Facilities and Services
Impacts by Alternatives, by County/Community, 1990

County/Community	Infrastructure Elements						
	Housing			Schools			
	Std. Household size	Alternative I (no action) (baseline) # new units req.	Alternative IV (all tracts) # new units required	1982 Excess Capacity		School Age Population Increase	
				Elem.	Middle & High Schools	Altern. I (no action) (baseline	Altern. IV (all tracts)
Fayette	2.82	472	--	NA	NA	-346	+62
Berry	2.82	48	78	NA	NA	-18	+55
Fayette	2.82	188	10	NA	NA	-328	+7
B'ham/Jefferson	2.31	7,892	431	NA	NA	-11,078	+250
Tuscaloosa	2.61 - 3.09	4,999	--	NA	NA	+1,942	+175
Northport	3.09	1,464	35	NA	NA	+446	+27
Tuscaloosa	2.61	2,268	220	NA	NA	+1,496	+148
Walker	2.0	3,610	--	NA	NA	+345	+13
Carbon Hill	2.0	82	0	NA	NA	+11	0
Jasper	2.0	274	24	NA	NA	+331	+11
Oakman	2.0	0	3	NA	NA	+3	+2

Alternatives II and III: Impacts less than Alternative IV (all tracts).

(continued)

Table 4-15. Housing and Community Facilities and Services
Impacts by Alternatives, by County/Community, 1990 (continued)

County/Community	Infrastructure Elements								
	Health Facilities						Police		
	Standards		Alternative I (no action) (baseline)		Alternative IV (all tracts)		Standard	Alternative I (no action) (baseline)	Alternative IV (all tracts)
	Hosp. Beds	N.H. Beds	Hosp. Beds	N.H. Beds	Hosp. Beds	N.H. Beds			
Fayette	4/1000 persons	4/1000 persons	+19	+136	+1	+1	1.9/1000 persons	--	--
Berry	"	"	--	--	--	--	"	--	--
Fayette	"	"	--	--	--	--	"	--	--
Jefferson/B'ham	"	"	-2446	+160	+4	+6	"	34.0	+2
Tuscaloosa	"	"	-363	-259	+2	+3	"	--	--
Northport	"	"	--	--	--	--	"	8.5	--
Tuscaloosa	"	"	--	--	--	--	"	+11.0	+1
Walker	"	"	-98	-59	--	--	"	--	--
Carbon Hill	"	"	--	--	--	--	"	--	--
Jasper	"	"	--	--	--	--	"	+1.0	--
Oakman	"	"	--	--	--	--	"	--	--

Alternatives II and III: Impacts less than Alternative IV (all tracts).

(continued)

Table 4-15. Housing and Community Facilities and Services
Impacts by Alternatives, by County/Community, 1990 (continued)

County/Community	Infrastructure Elements								
	Fire			Sewer System			Solid Waste		
	Standard	Alternative I (no action) (baseline)	Alternative IV	Standard	Alternative I (no action) (baseline)	Alternative IV	Standard	Alternative I (no action) (baseline)	Alternative IV
Fayette	2 FT* per 1000 houses	+3	--	100 gal. per cap. per day			.21 AC. per 1000 persons	.270	.053
Berry	"	--		"	+13,400	+22,100	"	.027	.046
Fayette	"	--		"	+53,000	+2,800	"	--	--
Jefferson/B'ham	"	+36	+2	"	+1,767,600	+99,600	"	3.800	.21
Tuscaloosa	"	+28	+1	"	--	--	"	2.900	
Northport	"	+9	--	"	+452,400	+10,900	"	.950	.023
Tuscaloosa	"	+12	+1	"	+592,000	+57,400	"	1.200	.12
Walker	"	+14	--	"	--	--	"	1.500	--
Carbon Hill	"	--	--	"	+25,400	--	"	.053	--
Jasper	"	+1	--	"	+54,000	+4,800	"	.116	--
Oakman	"	--	--	"	--	+500	"	--	--

Alternatives II and III: Impacts less than Alternative IV (all tracts).

*Full-time

Table 4-16. Fiscal Impacts by Alternatives

1985

ALTERNATIVE	Revenue Source: Federal Royalty Annual	Federal Royalty (Mine Life) Total	Severance Tax Annual	Severance Tax (Mine Life) Total	Abandoned Mine Reclamation Fund Annual	Abandoned Mine Reclamation Fund (Mine Life) Total
	$	$	$	$	$	$
Alternative I (No Action)	3,634,500	N/A	871,000	N/A	470,000	N/A
Alternative II	2,495,037	11,530,019	455,034	2,499,269	475,501	2,611,543
Alternative III	4,948,831	26,867,118	955,370	6,002,494	1,006,001	6,270,793
Alternative IV	4,948,831	26,867,118	955,370	6,002,494	1,006,001	6,270,793

1990

Alternative I (No Action)	1,317,806	N/A	586,250	N/A	280,000	N/A
Alternative II	9,657,715	327,935,964	2,116,797	65,031,875	1,042,264	29,968,750
Alternative III	10,906,226	339,068,737	2,437,731	67,839,845	1,377,589	32,902,450
Alternative IV	12,514,298	384,094,764	3,183,445	88,719,845	1,711,500	42,251,950

APPENDIX A

METHODOLOGY FOR WATER QUALITY PREDICTIONS

(There is no change in the text or figures in this section. The following summarizes the original DEIS section.)

Water quality predictions used in this EIS are for specific conductance, dissolved solids, sulfate, and hardness. They represent common mine drainage indicators. Regression equations derived to estimate these water quality constituents were derived from climatic, physiographic, and hydrologic data from 35 watershed sites. The equation for estimating specific conductance in surface water from mined basins is:

$$\text{SP. COND.} = 28.84 \frac{(\text{PBM})^{.407} (\text{MAF})^{.476}}{(\text{Q/A})^{.369} (\text{CL})^{.381}}$$

Where SP. COND. = specific conductance, in micromhos per centimeter at 25°C. and:

PBM = percent of basin mined
Q/A = streamflow, in cubic ft. per second per square mile
CL = average channel length or distance between stream sampling site and mined area, in miles
MAF = mine age-weight factor, a numerical value approximating a normal curve relationship with relative mine age and based on increased mineralization of mine drainage with time.

Estimates of specific conductance greater than 3,000 micromhos exceed the range of observed data and should be set equal to 3,000.

Specific conductance varies in proportion to the amount of material in solution and is thus frequently used to estimate mine drainage indicators such as dissolved solids, hardness, and sulfate concentrations. Regression equations and variables for these relations are given in table A-1. Since these water quality indicators are inversely related to streamflow discharge, estimates of concentrations represent ranges based on discharge variations.

Ground-water assessments are based on both synoptic and continuous field data collections at well sites in or near delineated tracts. Inventory data will be used to substantiate data transferability where data gaps exist in site-specific analyses.

Table A-1. Regression Equations and Variables for Selected Water Quality Parameters in Streams Draining Mined Areas

Equation	R*	Standard Error (Percent)	Range of Dependent Variable		Range of Independent Variable		Dependent Variable	Independent Variable
			Variable	Range	Variable	Range		
SO_4=1.10 Sp. Cond. $^{1.123}$	.989	17	SO_4	4.5-1300	Sp. Cond.	40-2160	SO_4=Dissolved sulfate concentrations in mg/l	Sp. Cond. = Specific conductance in micromhos per centimeter at 25°C.
HD = 0.20 Sp. Condc. $^{1.12}$	.989	16	HD	9-1400	Sp. Cond.	34-2160	HD=Hardness as calcium, magnesium carbonate, mg/l	Sp. Cond. = Specific conductance in micromhos per centimeter at 25°C.
DS = 0.57 Sp. Cond. $^{1.02}$	.992	11	DS	23-1060	Sp. Cond.	34-1410	DS = Dissolved solids concentration in mg/l	Sp. Cond. = Specific conductance in micromhos per centimeter at 25°C.

*R = correlation coefficient

APPENDIX B

HYDROLOGIC SUMMARY — LAKE TUSCALOOSA

Lake Tuscaloosa is a municipal water supply and recreation reservoir on North River in Tuscaloosa County (fig. B-1). The upstream drainage area is 417 square miles. The lake has a surface area of 5,885 acres and a length of 25 miles as measured along the old river channel. The lake was filled to a design elevation 232.2 feet above mean sea level in 1969.

Tuscaloosa city and county officials and interested citizens have expressed concern about hydrologic impacts to Lake Tuscaloosa from surface mining. Present legislation, if adhered to, will eliminate significant impacts of sedimentation on Lake Tuscaloosa which could result from Federal leasing alternatives. Present legislation includes Office of Surface Mining (OSM) Regulations (as amended), the Alabama Water Pollution Control Act of 1971, the Alabama Surface Mining Reclamation Act (ASMRA) of 1975 (as amended) and Federal Surface Mining Control Reclamation Act (SMCRA) regulations. Required mitigative measures will limit erosion and sedimentation to localized, short-term hydrologic impacts. Present mitigation requires that total suspended solid levels in effluent from detention ponds below disturbed surface areas are not to exceed 70 mg/liter at any time, or 35 mg/liter as an average for 30 consecutive discharge days (30 CFR 816.42 and 817.42). These mitigating measures will keep sediment yields in mined areas within the expected range for unmined areas for each leasing alternative.

Suspended solids resulting from the mining of Federal coal in North River basin, based on the preferred alternative, will be restricted to previously leased Little Tyro Creek and Piney woods Church tracts, and the delineated Revised Poplar Hollow and Crabbe Road tracts. These mines will be located in the upper reaches of Tyro, Dry, Bear, and Cripple Creeks. Based on the maximum average suspended solid concentrations allowed by law (35mg/l) and an average discharge of 1.5 cfs/sq. mi., the estimated sediment load from the mined area would be about 51 tons/sq. mi./yr. While this estimate may be low, it is significantly lower than loads of 106 to 193 tons/sq. mi./yr. measured in nearby undisturbed basins (Puente 1980, Shown 1982).

The chemical quality of water in Lake Tuscaloosa is good, having dissolved constituents generally ranging from 32 to 56 mg/l. Dissolved iron, manganese, and sulfate concentrations ranged from 0.05-0.26 mg/l, 0.01-0.11 mg/l and 8-12 mg/l, respectively. At USGS site 0246400 on North River near Samantha, water quality shows some impact due to previous mining, with a specific conductance range of 63-268 umhos, a dissolved iron range of 0.13-0.61 mg/l, dissolved manganese range of 0.11-0.34 mg/l, and dissolved sulfate range of 15-57 mg/l. More than half of the drainage into Lake Tuscaloosa is sampled here (219 sq. mi.).

Impacts to Lake Harris and Lake Nicol, other municipal reservoirs, that would result from the mining of Federal coal also would be minimal due to mitigating measures. Only one tract (Revised Watermelon Road) drains to these reservoirs under the preferred alternative.

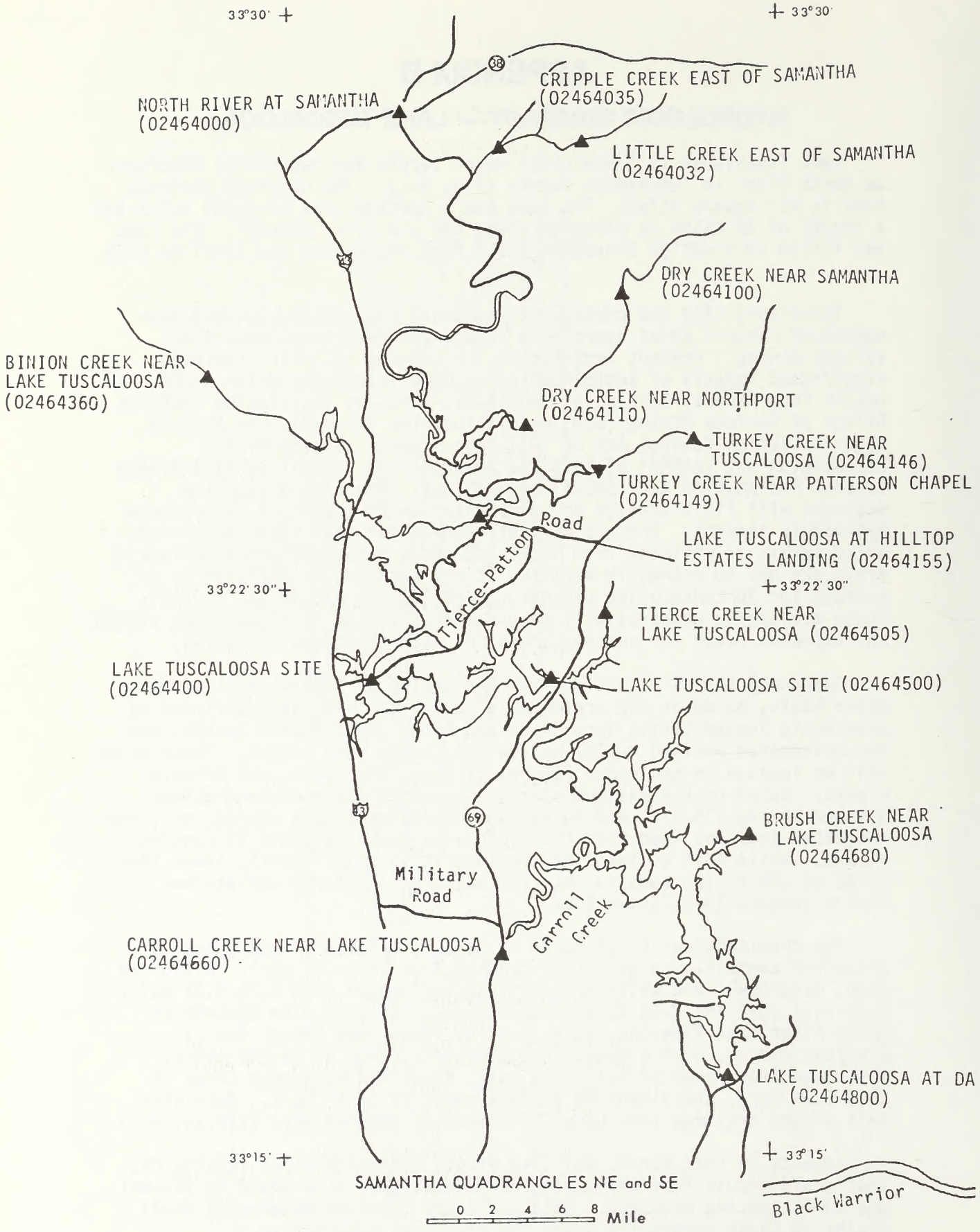


Figure B-1.—Lake Tuscaloosa and sampling sites.

APPENDIX C

ESTIMATED CHANGES IN RUNOFF RESULTING FROM FEDERAL LEASING

A physically based distributed precipitation runoff model was applied to 34 basins within the area of proposed action to simulate runoff under conditions of the various leasing alternatives, and to make estimates of any consequent changes in runoff characteristics. This methodology was selected because the model allows runoff simulation which may serve in lieu of observed data and because it is ideally suited to account for spatial variation of physical conditions within a basin.

The Precipitation Runoff Modeling System (PRMS), developed by the USGS Precipitation Runoff Modeling Group, was selected for use. PRMS simulates total watershed runoff based on driving variable data which describes precipitation and evapotranspiration. The total daily runoff simulated is the sum of three runoff components, surface runoff or overland flow, subsurface runoff or interflow, and ground-water flow. Driving variable data are evaluated daily for the period of application with respect to physical and initial hydrologic conditions, as described by the user, to determine component runoff volumes according to physically-based algorithems which describe individual hydrologic processes in the hydrologic cycle. To account for spatial variation, distinct hydrologic response units with unique parameter values are delineated in basins which include significant physical and/or hydrologic differences. Runoff for each hydrologic response unit is determined and then cumulated to determine total basin runoff. A comprehensive description of PRMS is available in the report, "Precipitation Runoff Modeling System; Users' Manual", a Water Resources Investigation in preparation by the U.S. Geological Survey.

Thirty-four basins were selected for model application: individual sites and the associated tract or tracts are identified in table 2-8 and located on figure 4-2. Sites 1-26 apply to site-specific analysis and include relatively small (0.29 - 3.96 mi^2) basins primarily drained by 1st and 2nd order streams which are affected by only one tract. Sites 27-34 apply to cumulative analysis and include relatively large (5.22 - 44.16 mi^2) basins which are affected by one or more tracts.

A total of six distinct hydrologic response units were described and then delineated in basins where they occurred using topographic maps, aereal photography, and information obtained from the tract delineation team. Hydrologic response units 1-4 consist of entirely Pottsville geology with different combinations of slope and vegetation. Hydrologic response units 5 and 6 consist of entirely Coker geology and entirely surface mined conditions, respectively. Table C-1 indicates the occurrence of hydrologic response units in each basin (a collective figure for units 1-4 is presented). PRMS parameter values for each hydrologic response unit have been developed by the USGS in the area of proposed action. The values have been developed during calibration efforts at five basins as part of a cooperative program with the BLM. Values for percent differences between simulated and observed annual runoff volumes vary from less than .1 percent to less than 10 percent,

and hydrographs of simulated discharge closely match hydrographs of observed discharge. The existing calibrations however, have not been physically verified and have been developed on a relatively short (five year) period of record. In addition, assumptions concerning the postmining character of areas to be mined under conditions of the proposed action were necessary. Consequently, results obtained through application of these calibrations must be treated as estimates.

Two applications of PRMS were made for each basin. In all cases in this appendix and appendix D, previous coal lease areas leased by the BLM were considered to be mined; areas to be leased under the proposed action were considered as mined only for the second application of PRMS. The first application was made under conditions of Alternative One in each basin. The second application was made under conditions of Alternative Four for sites 1-26; Alternatives Two, Three, and Four were considered at sites 27 to 34 as they applied.

A contiguous five-year period of precipitation and pan evaporation data was selected to drive PRMS for each application. Comparison of water year runoff volumes for each year in the driving data set with the 39 year mean runoff from a gaging station within the area of proposed action indicates that 1 dry, 2 wet, and 2 normal years are included.

Although the variation of individual Pottsville hydrologic response units is not reflected by the included collective Pottsville figures, it is readily apparent that Pottsville geology dominates all but one of the sites and that mining resulting from the proposed action will disturb Pottsville acreages (table C-1). The percentage to be mined under the proposed action approaches 50 percent at two sites but is generally significantly less (mean = 13.34 percent). Coker acreages can be significant but occur at only 30.60 percent of the sites. Percentages of existing mines are low, averaging 3.92 percent.

Simulated runoff figures in table C-2 were obtained by condensing roughly 1,500 figures concerning annual runoff volumes generated by PRMS applications. The annual figures themselves represent an even greater condensation. The net effect has been to mask the basic relations which contribute to general trends; consequently, only these general trends will be discussed. Individual site total runoff volumes from each application agreed closely but showed a decrease at 75 percent of the sites. Sites which showed the largest decreases were in the site-specific group (sites 1-26) and were scheduled to have relatively large acreages mined under the proposed action. All but two sites (99.4 percent) showed a slight decrease in total surface runoff under mined conditions. A correlation coefficient (cc) of 0.02 between these reductions and the percent of the basin mined suggests that other factors are also involved. Total volumes of subsurface runoff decreased at 82 percent of the sites and correlated reasonably well with percent of the basin mined (cc = 0.78) and with the reduction in Pottsville acreage (cc = 0.62) under mined conditions. Total ground-water runoff volumes increased at 97 percent of the sites and correlated well with percentage of the basin mined (cc = 0.70) and the decrease in subsurface runoff (cc = 0.90). A flow duration analysis of simulated runoff from

applications one and two at sites 9 and 16 indicates that these normally-ephermal streams behaved as perennial streams under mined conditions. These sites were selected because they have a nearly average and a high percentage of the basin to be mined respectively. The results suggest that, based entirely on simulated data, increases in ground-water flow volumes in mined basins are being released slowly and sustaining flow.

In general, the results of PRMS applications suggest that surface mining, changes flow characteristics as follows:

1. Total runoff volumes change slightly in proportion to the percent of the basin mined and generally decrease.

2. Surface runoff volumes decrease slightly.

3. Subsurface runoff volumes decrease in proportion to percent of the basin mined and the amount of Pottsville disturbed.

4. Ground-water runoff volumes increase in proportion to percent of the basin mined.

5. Increases in ground-water flow can sustain flow substantially.

TABLE C-1. Selected Basin Characteristics for each Watershed Site.

Site Number	Drainage area in acres	Percent for Application One		Percent for Application Two		Percent Existing Mine	Percent t Be Mined
		Pottsville	Coker	Pottsville	Coker		
1.00	958	100.00	0.00	96.03	0.00	0.00	3.97
2.10	1331	87.90	0.00	84.67	0.00	12.10	3.23
2.20	1331	87.90	0.00	86.63	0.00	12.10	1.28
3.00	1006	98.61	0.00	77.34	0.00	1.59	21.07
4.00	755	100.00	0.00	91.79	0.00	0.00	8.21
5.00	362	100.00	0.00	89.78	0.00	0.00	10.22
6.10	2533	93.76	0.00	92.26	0.00	6.24	1.50
6.20	2533	93.76	0.00	89.54	0.00	6.24	4.22
7.00	2297	97.56	0.00	95.78	0.00	2.44	1.78
8.00	1247	94.63	1.76	84.44	1.76	3.61	10.18
9.00	1488	100.00	0.00	50.54	0.00	0.00	49.46
10.00	1316	100.00	0.00	85.71	0.00	0.00	14.29
11.00	778	94.34	0.00	75.32	0.00	5.66	19.02
12.00	1142	100.00	0.00	88.44	0.00	0.00	11.56
13.00	301	100.00	0.00	81.40	0.00	0.00	18.60
14.00	1660	99.70	0.00	85.24	0.00	0.30	14.46
15.00	1626	100.00	0.00	86.96	0.00	0.00	13.04
16.00	920	100.00	0.00	88.48	0.00	0.00	11.52
17.00	313	100.00	0.00	91.69	0.00	0.00	8.31
18.00	236	100.00	0.00	92.80	0.00	0.00	7.20
19.00	1337	100.00	0.00	88.86	0.00	0.00	11.14
20.00	1814	100.00	0.00	83.96	0.00	0.00	16.04
21.00	695	100.00	0.00	87.34	0.00	0.00	12.66
22.00	741	81.11	18.89	68.15	18.89	0.00	12.96
23.00	188	100.00	0.00	69.15	0.00	0.00	30.85
24.00	1450	80.76	13.24	55.86	8.07	6.00	30.07
25.00	2278	66.86	11.59	33.49	11.59	21.55	33.36
26.00	1875	12.64	87.36	8.37	48.85	0.00	42.77
27.00	9025	96.37	0.24	92.90	0.24	3.39	3.47
28.00	28260	96.25	0.24	94.79	0.24	3.51	1.46
29.00	5898	98.32	1.68	91.12	1.68	0.00	5.68
30.00	8139	78.03	6.08	68.51	6.08	15.89	9.52
31.00	3345	95.72	0.00	87.77	0.00	4.28	7.95
32.00	7035	31.20	68.02	31.20	56.62	0.78	11.40
33.00	3008	81.85	0.00	79.16	0.00	18.15	2.69
34.00	4860	80.86	1.85	54.07	1.85	17.28	15.14

TABLE C-2. Simulated Runoff Volumes for each Watershed Site

Site Number	Drainage Area in Acres	Runoff Volumes in Inches for Application One				Runoff Volumes in Inches for Application Two				Inches of Change from Application One to Two	
		Total	Surface	Sub-Surface	Ground Water	Total	Surface	Sub-Surface	Ground Water	Decrease in Sub-Surface	Increased in Ground Water
1.00	958	156.29	19.23	130.34	6.72	156.26	19.10	128.41	8.75	1.93	2.03
2.10	1331	156.68	20.11	124.26	12.31	156.27	20.02	122.45	13.80	1.81	1.49
2.20	1331	156.68	20.11	124.26	12.31	156.81	20.06	123.55	13.20	0.71	0.89
3.00	1006	156.57	20.52	129.20	6.85	159.11	19.87	129.74	9.50	-0.54	2.65
4.00	755	162.00	20.21	134.83	6.96	163.11	19.98	135.13	8.00	-0.30	1.04
5.00	362	161.14	20.26	133.96	6.92	161.51	19.96	133.35	8.20	0.61	1.28
6.10	2533	159.83	20.15	132.05	7.63	160.65	20.10	132.74	7.81	-0.69	0.18
6.20	2533	158.81	20.15	128.96	9.70	158.14	20.03	126.47	11.64	2.49	1.94
7.00	2297	160.69	20.23	133.28	7.18	160.91	20.16	133.34	7.41	-0.06	0.23
8.00	1247	158.77	20.47	130.19	8.11	160.12	20.17	130.56	9.39	-0.37	1.28
9.00	1488	159.52	20.44	132.26	6.82	152.71	19.03	104.16	29.52	28.10	22.70
10.00	1316	156.22	20.55	129.01	6.66	154.28	20.14	120.92	13.22	8.09	6.56
11.00	778	161.79	20.17	130.91	10.71	155.16	19.80	116.13	19.23	14.78	8.52
12.00	1142	156.12	20.52	128.94	6.66	154.62	20.20	122.47	11.95	6.47	5.29
13.00	301	159.45	20.54	132.08	6.83	157.03	20.00	121.67	15.36	10.41	8.53
14.00	1660	156.12	20.52	128.81	6.79	153.79	20.12	120.25	13.42	8.56	6.63
15.00	1626	156.81	20.51	129.61	6.69	158.39	20.13	129.94	8.32	-0.33	1.63
16.00	920	161.25	20.43	133.91	6.91	159.93	20.24	127.48	12.21	6.43	5.30
17.00	313	152.33	18.26	127.47	6.60	153.57	20.33	122.84	10.40	4.63	3.80
18.00	236	158.61	20.37	131.45	6.79	157.67	20.16	127.42	10.09	4.03	3.30
19.00	1337	158.47	20.38	131.31	6.78	157.01	20.06	125.06	11.89	6.25	5.11
20.00	1814	163.68	20.12	136.51	7.05	161.62	19.65	127.54	14.43	8.97	7.38
21.00	695	162.21	20.19	135.02	7.00	160.55	19.83	127.93	12.79	7.09	5.79
22.00	741	163.93	22.48	125.98	15.47	148.74	20.00	106.87	21.87	19.11	6.40
23.00	188	161.24	20.24	134.05	6.95	150.27	19.36	109.81	21.10	24.24	14.15
24.00	1450	151.75	20.22	115.59	15.94	145.31	19.36	103.46	22.49	12.13	6.55
25.00	2276	150.07	19.92	107.91	22.24	145.78	18.97	89.25	37.56	18.66	15.32
26.00	1875	128.30	19.36	59.06	49.88	117.42	20.58	47.95	48.89	11.11	-0.99
27.00	9025	157.44	20.46	127.73	9.25	155.21	20.32	123.33	11.56	4.40	2.31
28.00	28260	157.02	20.50	128.06	8.46	156.81	20.46	127.24	9.11	0.82	0.65
29.00	5898	156.44	20.59	128.33	7.52	151.55	20.12	119.17	12.26	9.16	4.74
30.00	8139	153.18	20.17	116.04	16.97	151.52	19.90	110.30	21.32	5.74	4.35
31.00	3345	158.72	20.44	129.15	9.13	158.90	20.08	125.31	13.51	3.84	4.38
32.00	7035	150.50	20.55	96.24	33.71	147.88	19.96	93.99	33.93	2.25	0.22
33.00	3008	156.88	20.13	121.63	15.12	156.54	20.05	120.12	16.37	1.51	1.25
34.00	4860	154.66	19.95	119.12	15.59	152.55	19.51	110.51	22.53	8.61	6.94

FIGURE C-1. FLOW DURATION PLOT OF SIMULATED RUNOFF DATA FOR SITE 9.

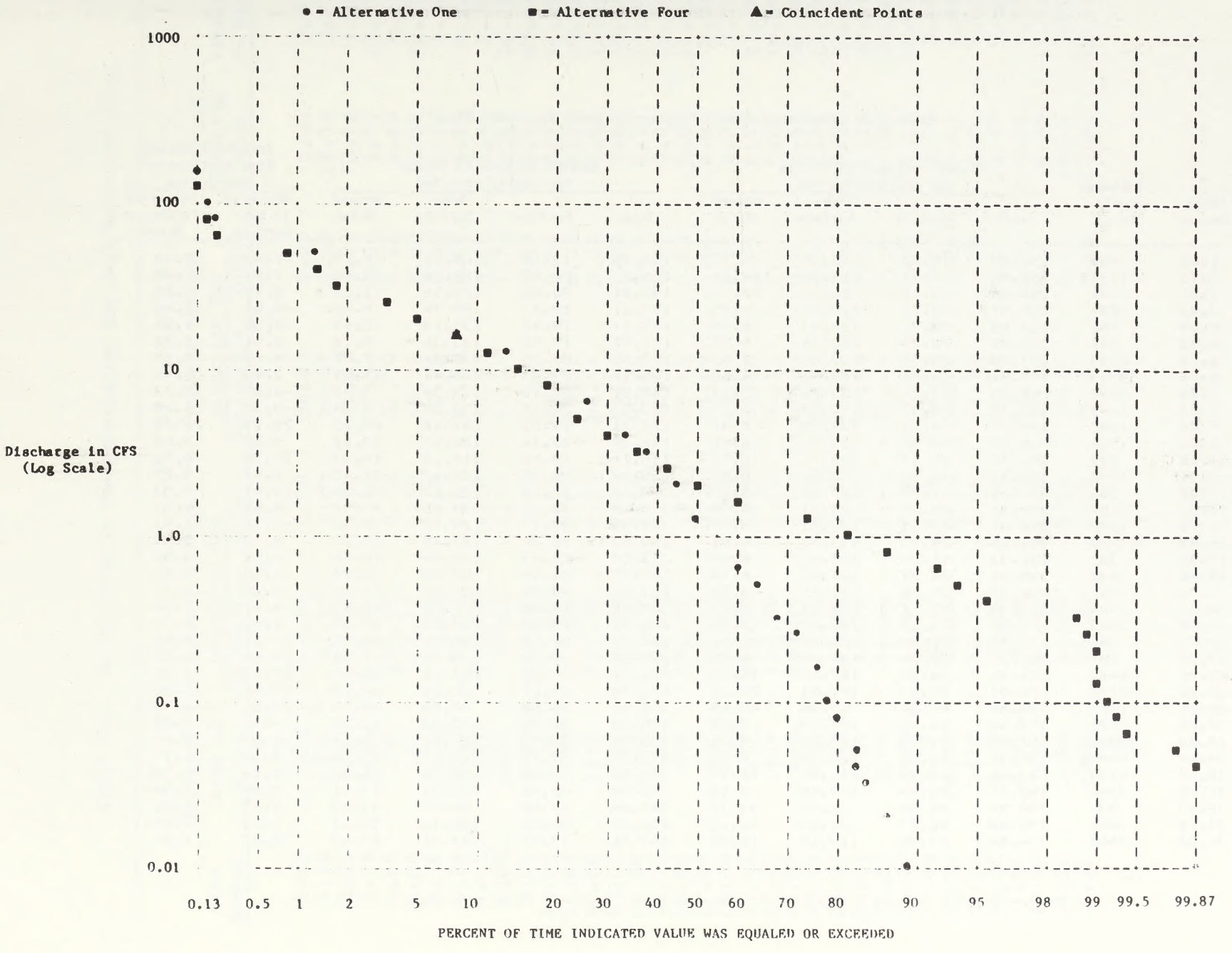
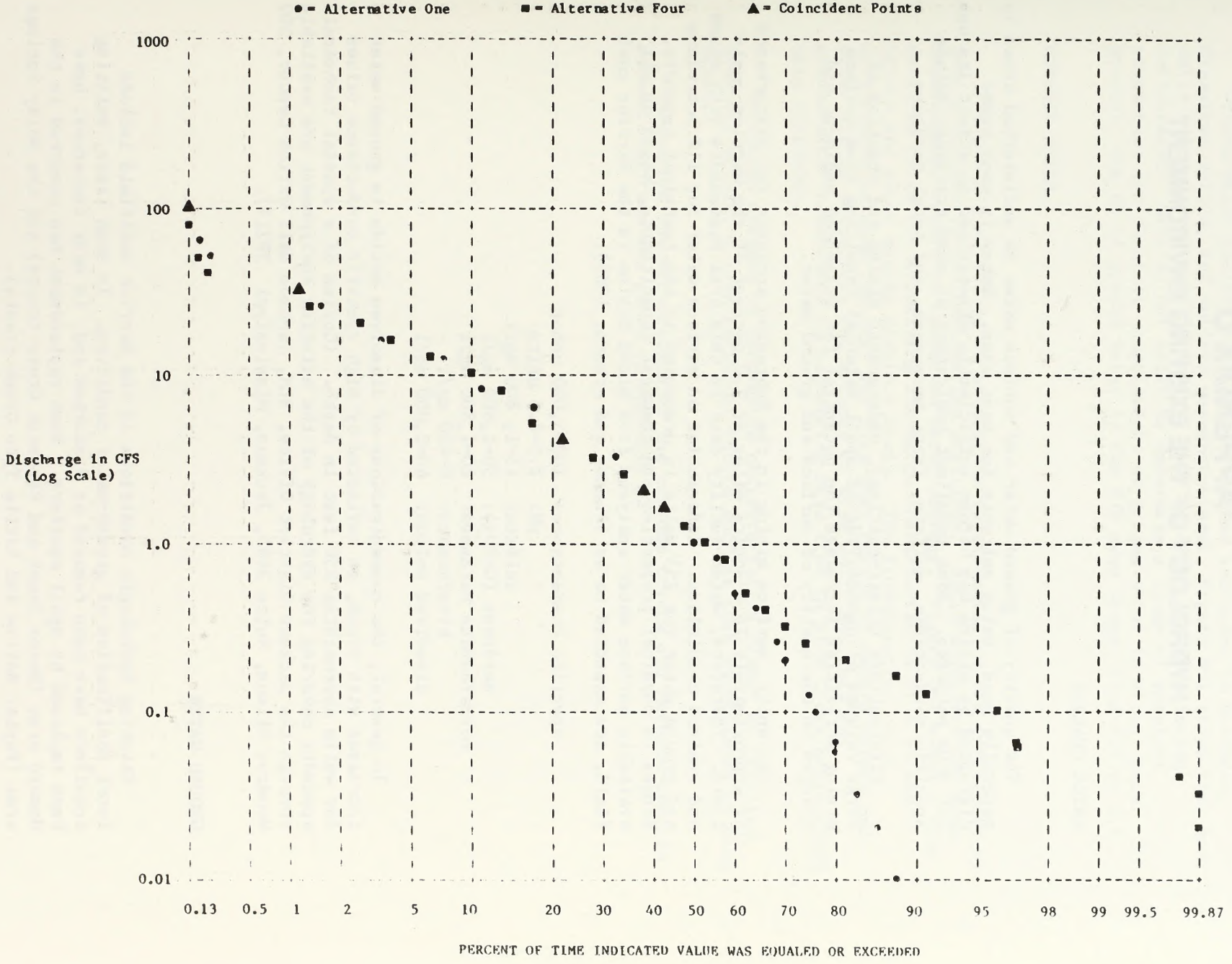


FIGURE C-2. FLOW DURATION PLOT OF SIMULATED RUNOFF DATA FOR SITE 16.



APPENDIX D

HYDROLOGY OF THE EXISTING ENVIRONMENT

WATER QUALITY

The quality of ground water and surface water in undisturbed areas is generally good, being suitable for most uses. Water in some areas disrupted by mining has become sufficiently mineralized to affect its use for some purposes. Some excellent indicators of mine drainage include specific conductance, sulfate, iron, manganese, and total hardness.

Silviculture (clear-cutting), underground mining and creation of large volumes of unconsolidated spoil material resulting from surface mining activities increases the potential for suspended sediment and changes in the quality of surface and ground water.

Currently, surface mining in the Subregion accounts for disturbance of approximately 76.4 square miles or 2.0 percent of the Warrior coalfield. Therefore, water-quality data in this area represents both mined and unmined conditions. Information on surface water for 112 locations and ground water for 253 wells is presented in the technical appendix. Ranges in physical properties and chemical constituents, based on all available surface water analyses from mined basins in the Warrior coal field, are expected to be (Puente and others, 1982):

specific conductance:	100-3,000 umhos
pH:	2.5-8.8 units
sulfate:	15-1, 800 mg/l
hardness ($CaCO_3$):	50-1,800 mg/l
noncarbonate hardness:	20-1,800 mg/l
bicarbonate:	0-450 mg/l
dissolved solids:	60-2,000 mg/l

In general, the concentrations of dissolved solids in ground water increases with depth, as reflected by high specific conductance values for wells approaching 250 feet in depth. (Copies of a special technical appendix covering the hydrology of the existing environment are available through the Jackson District Office, BLM, Jackson Mall Office Center, 300 Woodrow Wilson, Suite 3495, Jackson, Mississippi 39213).

GROUND WATER

Existing hydrologic conditions in the Warrior coalfield include local modification of ground-water condition. In some areas, existing acquifers have been removed or disturbed and, in many instances, have been replaced by spoil aquifers. Such replacement has occurred in the Howard area (Boxes Creek and Pleasant Grove tracts) and the Boley Springs area (Poplar Hollow and Little Tyro Creek tracts).

Ground-water quality is expected to show increases in hardness, dissolved solids, and sulfate concentrations. Figure D-1 shows that most wells (90 percent) are 250 feet or less in depth in the existing environment. Data do not exist to determine a range of physical properties and chemical constituents of ground water in mined areas. In general, the pH of ground water in the EIS area ranges from 4.4 to 8.6.

SURFACE WATER

The effects of mining on streamflow characteristics are influenced by mining procedures and reclamation practices. Spoil acquifers and mine impoundments result in increased water storage. Figure D-2 shows a flow duration curve for appraising discharge characteristics of a stream before and after mining within a basin. The flow-duration curve differences between the six- and five-year period of record before and after mining illustrate the effects of mine spoil aquifers and ground-water reservoirs in augmenting base flow to Blue Creek basin (USGS site 02462600).

Estimated changes in streamflow characteristics cannot be verified, however, without a long period of record such as that established at Blue Creek.

Streamflow characteristics of the various tracts and methods used in determining them are given in appendix C.

Figure D-1. Percentage Bar Chart for Well Depths in Existing Environment

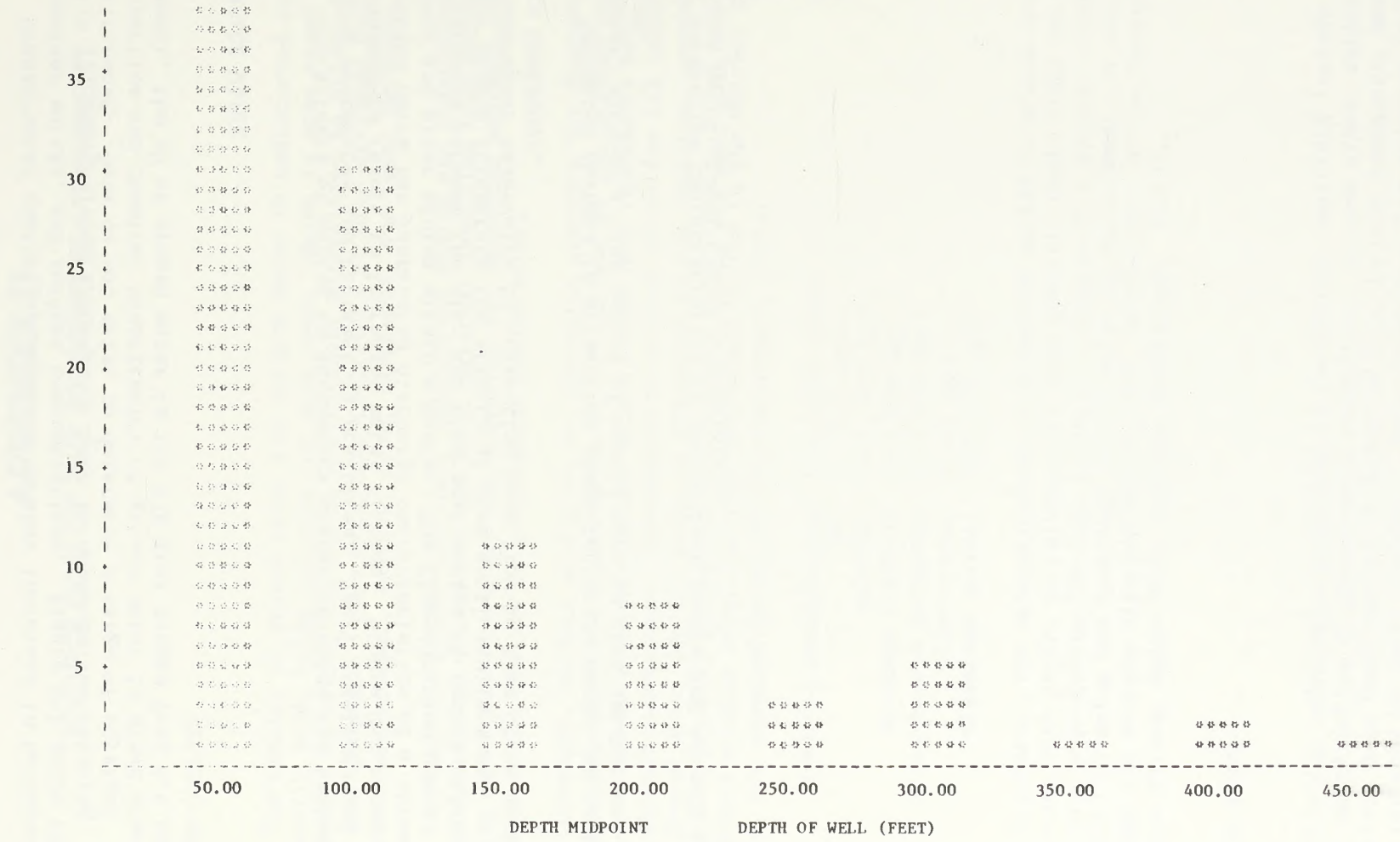
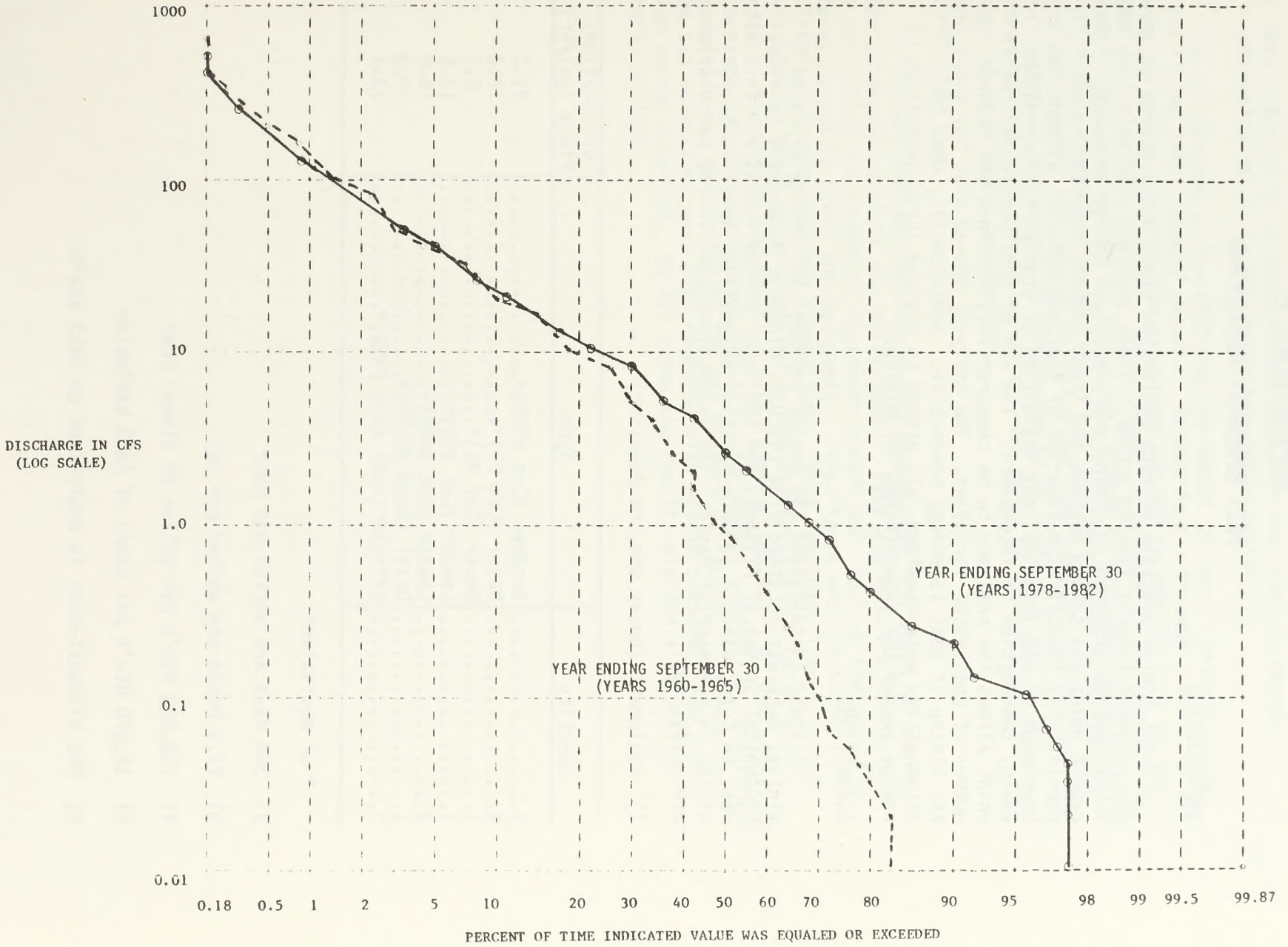


Figure D-2.

PRE-MINE AND POST-MINE FLOW DURATION PLOTS OF DISCHARGE FOR BLUE CREEK SITE 02462600



APPENDIX E

NET ENERGY ANALYSIS

INTRODUCTION

A net energy analysis of each delineated tract was prepared to assess the proposed Federal leasing action. These analyses evaluated only the actual energy expended in mining and the actual energy produced. This cutoff point was chosen because the Tract Summary Reports did not consistently identify the location of use/consumption. Without the knowledge of use location, any evaluation of transportation-related energy consumption is incomplete. The use of this particular cutoff point allows the analyses to be comparatively examined and reduces the number of unassessed variables. The analyses showed that for every tract the mining of coal is energy productive. Additionally, when the alternatives were examined, all proved to produce large quantities of energy versus the expenditures for mining.

ASSUMPTIONS

In order to calculate the energy consumed and energy produced by mining, data was obtained from the U.S. Minerals Management Service, Geological Survey of Alabama, and the local mining industry. This data was, in turn, used to produce a set of assumptions specific to coal mining in the Warrior Basin. The assumptions used in the calculations are as follows:

1) Equipment (heavy use, no downtime)

Quantity	Type	Consumption/ Piece (gal/hr)
1	Scraper (Cat 637D)*	31.3
2	Dozer (Cat D9)*	18.8
1	Dozer (Cat D6)*	6.4
1	Loader (Cat 980)*	11.6
2	Loader (Cat 988B)*	18.0
1	Drill (Reed SK-35)*	10.0
3	Offroad Truck (Cat 733B)*	13.1

* or equivalent

2) 300 days are worked per year

3) 22.5 hours are worked per day

4) 136,000 Btu's per gallon of diesel fuel

5) 18,670 Btu's per pound of ANFO explosive

6) One kilowatt-hour is equivalent to 3413 Btu's.

7) Bank cubic yards of overburden = (tons of coal surface mined) x (stripping ratio) + (50% overburden swell factor)

The Btu content of the coal and the amount of annual production was given in the Tract Summary reports. Assumptions 1 through 7 were for an operation with a capacity for producing 100,000 to 250,000 tons of coal annually by surface methods. Where projected production lay outside the above limits, the numbers of individual pieces of equipment were adjusted accordingly. However, the overall mix of equipment remained unchanged. Dragline capacity and amount of explosives used were estimated after the calculation of the amount of overburden to be moved. Electricity consumption by underground operations was based on data provided for the first round of tract delineation.

METHODOLOGY

To compare consumption with energy production, all forms of energy were converted to their Btu equivalents. This was done for consumption by estimating the amount of equipment needed and figuring the amount of energy needed to power the equipment. This figure was, in turn, multiplied by the use-time assumptions. This resultant figure is then converted to Btu's by multiplying by the appropriate Btu conversion factor. (Amount of equipment) x (Fuel consumption/hour) x (Hours/days) x (Days/year) x (Btu conversion factor). For energy production, the annual production was multiplied by the Btu conversion factor. The results of the two operations were then compared with energy consumed, subtracted from energy produced. In all cases the results yielded a favorable energy balance.

APPENDIX F

TRACT RANKING

On February 9, 1983, the RCT met to rank the 16 delineated tracts using the factors listed below. They were ranked into low, medium, and high categories of desirability for leasing. Table F-1 shows the results of the RCT ranking of all the tracts as delineated and the rationale for the ranking of each tract.

A. Coal Economics

1. Tract Potential for Development
2. By-Pass
3. Suitable for Small Operators
4. Industry Interest
5. Total Tons Recoverable
6. Total Federal Tons Recoverable

B. Socio-Economics

1. Personal Income
2. Severance Tax
3. Federal Royalty
4. Abandoned Mine Reclamation Fund
5. Surface Owner Consent

C. Environmental

1. Surface water - Criteria included total acres to be mined, reservoir(s) potentially impacted, and distance from tact to reservoir.
2. Groundwater - Number of wells potentially impacted in relation to Recoverable Federal Reserves.
3. Productivity - Criteria included acres of bottomland hardwood and productivity values including site indices (50-year growth value for loblolly pine).
4. Wildlife - Criteria included carrying capacity for deer and turkey, and whether tract contains acreage that is included in a public wildlife management area.
5. Aquatic Life - Number of headwater streams in tract.

Table F-1. Ranking and Rationale for Coal Tracts
Southern Appalachian Coal Region,
Round Two

Tract Name	Type	Summary Ranking	Rationale*
Revised Willis Chapel	Surface	Medium	Medium quality coal may need to be washed or blended. Located in Wolf Creek Wildlife Management Area. Some adverse impacts on wildlife. Good tract for small business.
Revised Crabbe Road	Surface	Medium	High sulphur, but washing and blending is feasible. potential impacts to Lake Tuscaloosa. Low impacts on wildlife. Public Body set aside.
Revised Bagwell Road	Surface	Medium	High coal quality. Potential impacts to Bankhead and Holt Lakes. Some adverse impacts on wildlife. Good tract for small business. Public Body set aside.
Revised Pendley	Surface	Medium	Medium quality coal may need to be washed or blended. Located in Wolf Creek Wildlife Management Area. Some adverse impacts on wildlife. Good tract for small business.
Lockhart Hill	Surface	Medium	High sulphur, but washing and blending is feasible. Located in Wolf Creek Wildife Management Area. Some adverse impacts on wildlife. Industry interest expressed.
Revised Boxes Creek By-Pass	Surface	High	High sulphur, but washing and blending is feasible. Industry interest expressed. Potential By-Pass.

*All coal will be used for steam generation, except where noted.

Table F-1 (continued)

Tract Name	Type	Summary Ranking	Rationale*
Revised Poplar Hollow	Surface	Medium	Very high sulphur, although industry activity indicates it is marketable. Some adverse impacts on wildlife. Walkover by BLM/USFWS showed no red-cockaded woodpeckers. Potential impacts to Lake Tuscaloosa. Surface owner problem resolved through redelineation.
Spencer Hill	Surface	Medium	Good quality coal. Some adverse impacts on wildlife. Potential impact to Bankhead Lake. Industry interest expressed. Surface owner problem resolved through redelineation.
Pleasant Grove Church	Surface	High	Moderate quality coal. Potential impacts on Lake Tuscaloosa. Industry interest expressed.
Revised Watermelon Road	Surface	Medium	Good quality coal. Some adverse impacts on wildlife. Located in private wildlife management area. Potential impacts on Lakes Nicol and Harris. Industry interest expressed.
Jock Creek	Surface	High	Good coal quantity and quality. Some adverse impacts on wildlife. Walkover by BLM/USFWS showed no Red Cockaded Woodpecker. Industry interest expressed.
Panther Branch	Surface	High	Good coal quality and quantity. Some potential impacts to wildlife. Areas privately managed for hunting. Industry interest expressed.

*All coal will be used for steam generation, except where noted.

Table F-1 (continued)

Tract Name	Type	Summary Ranking	Rationale*
Revised Wiley	Underground	Medium	Questionable coal quality and transportation. Scattered mineral ownership.
Cripple Creek	Underground	High	High coal quality and quantity. Questionable transportation. Metallurgical coal.
Sandtown	Underground	High	Good coal quantity and quality. Good transportation.
Blue Creek	Underground	High	High coal quality and quantity. Good configuration of mineral ownership. Metallurgical coal.

*All coal will be used for steam generation, except where noted.

ABORIGINAL AMERICANS. The original (indigenous) inhabitants of the United States and their descendants (Indians and Eskimos).

ACCELERATED EROSION. Erosion much more rapid than normal, natural geological erosion; primarily as a result of the influence of the activities of man, or in some cases, animals.

ADT. Average Daily Traffic.

AD VALOREM. In proportion to the value. Ad valorem taxes are based on property or other values.

ALLUVIAL. A general term for all detrital material deposited or in transit by streams, including gravel, sand, silt, clay, and all variations and mixturea of these; unless otherwise noted, alluvium is unconsolidated.

ARTIFACT. Any object made, modified, or used by man.

ASH. The inorganic residue remaining after ignition of combustible substances.

ATTITUDE. An intellectual or emotional position regarding a fact, condition, state, person, or other entity, producing a readiness to act in a certain manner.

AVAILABLE WATER CAPACITY. The capacity of a soil to hold water in a form available to plants. Amount of moisture held in soil between field capacity, or about one-third atmosphere of tension, and the wilting coefficient, or about 15 atmospheres of tension.

BACKFILL. The process of filling, or the material used to fill, a surface mine pit.

BACKGROUND. As applied to VRM, the area of a distance zone which lies beyond the foreground/middleground. Usually from a minimum of 3 to 5 miles to a maximum of about 15 miles from a travel route, use area, or other observer position.

BED. A subdivision of a stratified sequence of rocks, internally composed or relatively homogeneous material and separated from the rocks above and below by well-defined boundary planes.

BEDROCK. The more or less solid rock in place either on or beneath the surface of the earth.

BEST TECHNOLOGY CURRENTLY AVAILABLE. Equipment, devices, systems, methods, or techniques which (a) prevent, to the extent possible, additional contributions of suspended solids to streamflow or runoff outside the permit area, but in no event result in contributions of suspended solids in excess of requirements set by applicable state or Federal laws; and (b) minimize, to the extent possible, disturbances and adverse impacts on fish, wildlife, and related environmental values, and achieve enhancement of those resources where practicable.

BIOME. A major subdivision of the earth's surface which possesses a particular climate, vegetation, and characteristic groups of animals, e.g., desert, tundra, deciduous forest, etc.

BLM CLASS III INVENTORY. As applied to cultural resources: an intensive field inventory designed to locate and record, from surface and exposed profile indications, all cultural resources properties within a specified area. Upon completion, no further cultural resource inventory work is normally needed.

BOTTOMLAND FOREST. Deciduous-forested wetlands adapted to seasonally-fluctuating water levels and occupying floodplains that flank river systems.

CAMBRO-ORDOVICIAN. A span of geologic time extending from 600 million to 430 million years ago.

CATEGORY 1 SPECIES. Species for which the FWS has substantial biological information to support a proposal to list the species as Endangered or Threatened.

CLAY. A loose, earthy, extremely fine-grained, natural sediment or soft rock composed of particles having a diameter of less than 1/256 mm.

CLIMAX VEGETATION. The type of natural vegetation that would occur in a particular geographic area if that vegetation were not disturbed by man or natural disasters.

COALFIELD. An area of country, the underlying rocks of which contain workable coal seams.

COLLUVIUM. Loose, unconsolidated clay, silt, sand, and gravel at the foot of a slope, brought there by force of gravity.

COMMUNITY FACILITIES AND SERVICES. Equipment and activities which support the economic and residential functions of an area. Examples are schools, police, and water systems. As used in this study, the term limited to those that are provided by local communities and school districts.

CRETACEOUS. A span of geologic time extending from 136 million to 65 million years ago.

DEMOGRAPHY. The statistical study of human populations; includes size, density, distribution, and vital statistics.

DEMONSTRATED COAL RESOURCES. The sum of both measured and indicated resources and reserves of coal.

DIP. The angle that a structural surface, e.g., s bedding or fault plane, makes with the horizontsl.

DISPLACEMENT. The relative movement of the two sides of a fault, also the specific amount of such movement.

DISSOLVED SOLIDS. Consist mainly of the dissolved mineral constituents in water and is represented by the residue that remains after evsporation snd drying at a temperature of 180°C.

DISTANCE ZONE. As applied to VRM, the arca that can be seen as foreground/middleground, background, or seldom seen.

DISTURBED LAND. Land on which excavation has occurred or upon which overburden has been deposited, or both.

ECONOMIC MODEL. A mathematical representation of an ares's economy.

ERODIBLE. Susceptible to erosion. (Expressed by terms, such as highly erodible, and slightly erodible).

EROSION. The process by which the surface of the earth is worn away by the sction of water, wind, etc.

EDGE. A place where two or more vegetative types come together.

EVAPOTRANSPIRATION (ET). Evaporation from soil and water surfaces in sddition to transpiration from plants, primarily through lesves.

FAULT. A surface or zone of rock fracture along which there has been displacement.

FMO. Federal Minerals Ownership.

FOLD. A curve or bend of rock beds.

FOLK HOUSE. As applied to Wsrrior Basin rural houses, "folk" refers to any building that was derived from prototypes of the Upland South Culture (prior to 1800); the principal features of folk houses were tsken from European folk sources.

FOREGROUND/MIDDLEGROUND. As applied to VRM, the area visible from a travel route, use area, or other observer position to s distance of 3 to 5 miles. The outer boundary of this zone is defined ss the point where the texture and form of individual plants sre no longer spparent in the landscape. Vegetation is spparent only in patterns or outline.

FORMATION. The ordinary unit of geologic mapping consisting of a large and persistent stratum or bed of one kind of rock.

FOSSIL. Any remains, impressions, or traces of an animal or plsnt of past geologic ages that have been preserved in the earth's crust.

FRAGILE LANDS. Geographic areas containing importsnt natural, ecologic, scientific, or aesthetic resources that could be adversely affected by surface coal mining operations.

GRAVEL. An unconsolidated sccumulation of rounded rock fragments consisting of psrticles larger than 2 mm.

HARDNESS. A physical-chemical characteristic that is commonly recognized by the increased quantity of soap required to produce lather. It is attributable to the presence of alksline earths (principslly calcium and magnesium) and is expressed as equivalent calcium carbonate ($CaCO_3$). The following scale will sid in appraising degrees of hardness range (mg/l): 0-60 (soft), 61-120 (moderately hard), 121-180 (hard), and greater than 180 (very hard).

HIGH CONTRAST EDGE. A place where two vegetative types of markedly different structural appearance come together, e.g., where a pasture and a mature forest meet.

HIGH VOLATILE "A" BITUMINOUS COAL. Bituminous coal is s dense, dark, brittle, bsnded coal that is well jointed snd is possessed of a blocky frscture. Vegetable matter is not ordinarily visible to the eye. Based on proximate analysis, high volatile "A" bituminous coal contains approximately 57 percent fixed carbon, 40 percent volatile matter, and 3 percent moisture.

HIGHWALL. The unexcavated fsce of exposed overburden and coal in a surface mine or the face or bank on the uphill side of a contour strip mine excavation.

HISTORIC RESOURCES. All evidences of human activity that date from historic (i.e., recorded history) periods.

HORIZON. A particular stratigraphic level in the geologic column.

HORIZON, SOIL. A lsyer of soil, spproximately parallel to the surface, that has distinct characteristics produced by soil-forming processes.

INDIRECT IMPACTS. Impacts caused by something which, itself, is a result of something else. In economics, indirect impacts are caused by growth in trade and service activities, which themselves, result for a primary source of growth such as mining.

INFRASTRUCTURE. See COMMUNITY FACILITIES AND SERVICES.

ISOLATED FIND. An artifacet displaced from its orignal or intended contextual position by nature or man-made forces.

LITHIC SCATTER. An archaeological site characterized by the presence of flaked stone tools, chips, cores, or flakes only; usually on the surface with no vertical depth.

LUA. Land Use Analysis (North Central Alabama).

MISSISSIPPIAN. A span of geologic time extending from 345 million to 320 million years ago.

MITIGATION. A design feature, i.e., an integral part of leasing alternatives (516 DM 4.10B) including, hut not limited to:
(a) Avoiding the impact altogether by not taking a certain action or parts of an action.
(b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
(c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
(d) Reducing or eliminating the impact over time hy preservation and maintenance operations during the life of the action.
(e) Compensating for the impact by replacing or providing substitute resources or environments.

NATIONAL GEODETIC VERTICAL DATA OF 1929 (NGVD). Geodetic datum derived from a general adjustment of the first order level nets of both the United States and Canada. It was formerly called "Sea Level Datum of 1929" or mean sea level." Although the datum was derived from the average sea level over a period of many years at 26 tide stations along the Atlantic, Gulf of Mexico, and Pacific Coasts, it doea not necessarily represent local mean sea level at any particular place.

NATIONAL REGISTER OF HISTORIC PLACES. A register of districts, sites, structures, and objects of national, State, or local significance in American history, architecture, archeology, engineering, and culture maintained by the Secretary of the Interior.

NONQUALIFIED SURFACE OWNERS. The owner(s) of surface lands of split estate lands who do not meet the requirements of section 714 of SMCRA (See Qualified Surface Owner).

OUTCROP. That part of geologic formation that appears at the earth's surface.

OVERBURDEN. The earth, rock, and other materials that lie above a mineral deposit.

PALEOZOIC. A span of geologic time extending from 600 million to 225 million years ago. Cambro-Ordovician, Pennsylvanian, and Mississippian are divisions with the Paleozoic Era.

PALUSTRINE. Nontidal wetlands dominated by trees, shrubs, persistent emergents, and emergent moases or lichens.

PARENT MATERIAL. The unconsolidated, more or less chemically weathered mineral or organic material from which the soils have developed by pedogenic proceases. Horizon C of the soil profile.

PENNSYLVANIAN. A span of geologic time extending from 320 to 280 million years ago.

PER CAPITA. Per unit of population. Per capita projections assume the same growth rate as population.

PERMEABILITY (Soil). The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are: very slow, slow, moderately slow, moderate, moderately rapid, rapid, and very rapid.

PLATEAU. A flat, upland region underlain by horizontal beds which may be highly dissected.

POTHUNTING. Amateur (iiiegal) artifact collecting; site vandalism.

PRECIPITATION. The discharge of water, in liquid or soiid state, out of the atmosphere, generally upon land or water surface. The term also is used to designate the quantity of water that is precipitated.

PRESHITORIC RESOURCES. All evidences of human activity that date to that period of time before written records (usually refers to Pre-Columbian period).

PRIME FARMLANDS. Lands which have an adequate and dependahle moisture supply from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt/sodium content, with few or no rocks, and which meet the OSM criteria for designation as such.

QUALIFIED SURFACE OWNER. The natural person or persons (or corporation, the majority stock of which is held by a person or persons) who: 1) hold legal or equitable title to the surface of split estate lands; 2) have their principal place of residence on the land, or personally conduct farming or ranching operations upon a farm or ranch unit to be affected by surface mining operations; or receive directly a significant portion of their income, if any, from such farming and ranching operations; and 3) have met the conditions of paragraphs (1) and (2) of this subsection for a period of at least 3 years, except for persons who gave written consent less than 3 years after they met the requirements of both paragraphs (1) snd (2) of this section. In computing the three-year period the authorized officer shall include periods during which title was owned by a relative of such person by blood or marriage if, during such periods, the relative would have met the requirements of this subsection.

RAINFALL. The quantity of water that falls as rain only. The term is not synonymous with precipitation.

RECLAMATION. The process of returning resource values to lands affected by controlled land disturbances to a form and productivity consistent with a stated land use plan which includes a stable ecological state, is compatible with the values of the surrounding lands, and is executed on lands which are fully capable of supporting the uses which they were capable of supporting prior to disturbance.

REFRACTORY CLAY. A material of very high melting point with properties that make it suitable for such uses as furnace lining and kiln construction.

RESERVOIR. A natural underground container of fluids, such as oil, gas, water. In general, such reservoirs were formed by local deformation of beds, by changes or porosity, and by intrusions.

RESIDUAL MATERIAL. Unconsolidated or partly weathered parent material of a soil, presumed to have developed in place (by weathering) from the consolidated rock on which it lies; it is the material from which soils are formed.

RIPARIAN ECOSYSTEM. A specialized form of wetlsnd restricted to aress along, adjacent to, or contiguous with perenially and intermittently flowing rivers and streams; also, periodically flooded lake and reservoir shore areas, as well as lakes with stable water levels and characteristic vegetation.

ROLL. A local thickening of roof or floor beds, causing thinning of a coal seam.

SAND. A loose aggregate of uncunsolidated mineral or rock frsgments consisting of particles 1/16 to 2 mm in diameter.

SANDSTONE. A medium-grained, elastic sedimentary rock composed of abundant and rounded or angular fragments of sand size set in a fine-grained matrix (silt or clay) and more or less firmly united by a cementing material (commonly silica, iron oxide, or calcium carbunate); the cunsolidated equivslent of sand.

SECONDARY IMPACTS. See INDIRECT IMPACTS.

SCENIC QUALITY. The degree of harmony, contrast, and variety within a landscape.

SCENERY UNIT. As applied to VRM, scenery in the 3-county area was rated using the Scenic Quality Inventory Chart provided in BLM Manual 8410. Seven scenery units were represented in the study area.

SENSITIVITY. As applied to VRM, that degree of concern expressed by the user toward scenic quality and existing or proposed visual change in s particular characteristic landscape.

SELDOM SEEN. As applied to VRM, portions of the landscape which are generally not visible from high to medium visual sensitivity level observer positions, and which sre visible beyond approximately 15 miles frum these positions.

SEDIMENT. Solid material that originates mostly from disintegrated rocks and is transported by, suspended in, or deposited from water; it includes chemical and biochemical precipitates and decomposed organic material such as humus. The quantity, characteristics, and source of sediment in streams are influenced by environmental factors, such as degree and length of slope soil characteristics, land usage, and quantity and intensity of precipitation.

SHALE. A fine-grained, indurated, detrital sedimentary rock formed by the consolidation (as by compression or cementation of clay, silt, or muds, and characterized by finely stratified (laminae 0.1-0.4 mm thick) structure and/or fissility that is approximately parallel to the bedding (along which the rock breaks readily into thin layers), and that is commonly most conspicuous on weathered surfaces, and by a composition with an appreciable content of clay minerals or derivatives from clay minerals, and with a high content of detrital quartz.

SILTSTONE. An indurated, or somewhat indurated silt, having texture and composition, but lacking the fine lamination or fissility, of shale.

SITE-SPECIFIC. A specific project area analyzed in the environmental statement.

SOCIAL GROUP. An abstract structuring of two or more social statuses tied meaningfully together by reciprocal behavioral expectations (norms). Becomes "visible" only when actual persons occupy the various positions and behave toward each other in recognizable conformity to the expectations.

SOCIAL IMPACT. "The difference which (energy development) makes in the lives of those concerned" (Gold, 1976, p. 3).

SOCIAL STRUCTURE. A more ur less integrated system of interacting groups in a community or society which provide the social framework within which the ongoing activities of the community or society are carried out, and which provide the various dimensions defining the overall position of each individual within that community or society.

SOIL ASSOCIATION. A mapping unit used on general soil maps, in which two or more defined taxonomic units occurring together in a characteristic pattern, are combined on the map into one unit. The components of the soil assuciation may or may not be contrasting.

SOIL PRODUCTIVITY. The capacity of a soil in its normal environment for producing a specified plant or sequence of plants under a specified system of management.

SOIL SERIES. A group of soils having horizons similar in characteristics and arrangement in the soil profile, except for texture of the surface portion.

SOIL STRUCTURE. The combination or arrangement of primary soil particles (sand, silt, clay) into secondary particles, units, or peds. The secondary units or soil aggregates are characterized and classified on the basis of size, shape, and degree of distinctness into classes, types, and grades, respectively.

SOIL TEXTURE. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse, fine, or very fine."

SPECIES DIVERSITY. A relative measure of the number of species and the number of individuals of each species in a given area, i.e., areas of high species diversity contain a large number of species and a large number of indiduals of each species.

SPECIES OF SPECIAL EMPHASIS. Those fish, wildlife, and plant species of special biological, legal, or public interest, upon which the FWS attention and effort is focused.

SPECIFIC CONDUCTANCE. A measure of the ability of a water to conduct an electrical current and is expressed in micromhos per centimeter at 25°C. Because the specific conductance is related to the number and specific chemical types of ions in solution, it can be used for approximating the dissolved-solids content in the water. Commonly, the amount of dissolved solids (in milligrams per liter) is about 65 percent of the specific conductance (in micromhos per cm at 25°C). This relation is not constant from stream to stream, and it may even vary within the same source.

STEEP SLOPE. Any slope above 20 degrees or such lesser slope as may be defined by the regulatory authority.

SUBSOIL. The B horizons of soils with distinct profiles. In soils with weak profile development, the subsoil can be defined as the soil below the plowed soils (or its equivalent of surface soil), in which roots normally grow.

SUBSTRATA. Layers lying beneath the soil solum, either conforming (C or R) or unconforming.

SUBSTRUCTURE. The structural foundation of a historic building.

SURFACE MINING. Mining method whereby the overlying materials are removed to expose the mineral for extraction.

SURFACE OWNER. An entryman, or person(s), or a corporation, who holds legal title to the land surface.

SURFACE RUN-OFF. The run-off that travels over the soil surface to the nearest surface stream, run-off of a drainage basin that has not passed beneath the surface since precipitation. The term is misused when applied in the sense of direct run-off.

SYNCLINE. A trough-shaped fold, the core of which contains the stratigraphically younger rocks.

"TECHNICALLY PRIME" FARMLAND. Land that could be prime farmland if it met the historical cropping criterion of prime farmland.

TERRACE. Any long, narrow, relatively level or gently inclined surface, generally less broad than a plain, bounded along one edge by a steeper descending slope and along the other by a steeper ascending slope. A terrace commonly marks a former water level.

THROW. The vertical movement of a fault measured perpendicular to the strike of the fault.

TOPSOIL. The original or present dark-colored upper soil (A horizon) that ranges from a mere fraction of an inch to 2 or 3 feet thick on different kinds of soil.

UPDIP PINCHOUT. A stratigraphic trap of oil, gas or water formed by the thinning out of a porous and permeable rock (e.g. sandstone) between two layers of impermeable rock (e.g. shale). The trap is oriented upwards and parallel to the dip of the structure.

V/C. Volume to capacity ratio.

VISUAL RESOURCE. The land, water, vegetative, animal, and other features that are visible on all lands (scenic values).

VISUAL RESOURCE MANAGEMENT (VRM). A systematic approach to identifying visual resources and assigned classifications representing perception levels of the scenery being viewed.

VISUAL RESOURCE MANAGEMENT CLASS. The degree of visual change that is acceptable within the characteristic landscape. It is based upon the physical and sociological characteristics of any given homogeneous area and serves as a management objective.

VRM Class III. Allows for BLM management activities to be visually evident but subordinate to the landscape character.

VRM Class IV. Allows for BLM management activities to subordinate the landscape character.

VRM Class V. Identifies areas where man-made disturbance is excessive and rehabilitation is needed.

WRITTEN CONSENT. Means the document or documents that a qualified surface owner has signed that, 1) permit a coal operator to enter and commence surface mining of coal, 2) describe any financial or other consideration given or promised in return for the permission, including in-kind considerations, 3) describe any consideration given in terms of type or method of operation or reclamation for the area, 4) contain any supplemental or related contracts between the surface owner and any other person who is a party to the permission, and 5) contain a full and accurate description of the area covered by the permission.

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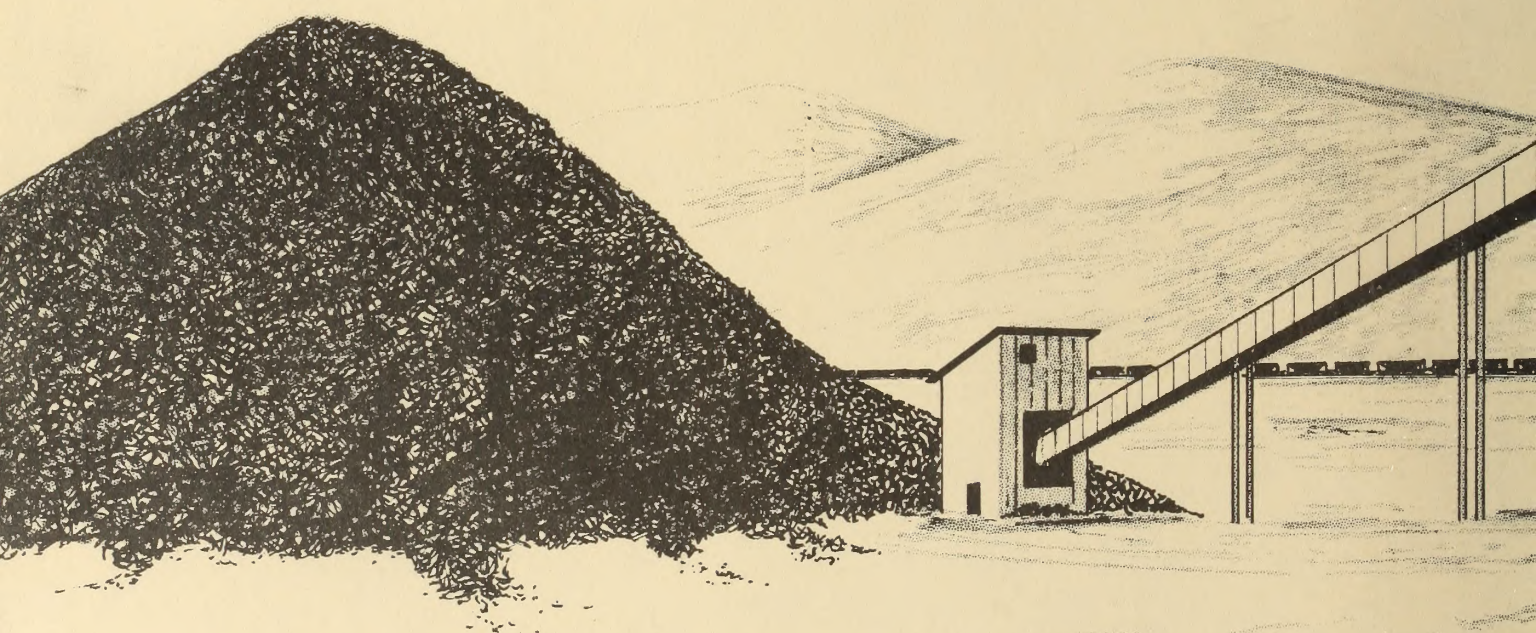
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